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OF THE

Mining Industry of Idaho

FOR THE YEAR

1912

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ROBERT N. BELL
STATE INSPECTOR OF MINES

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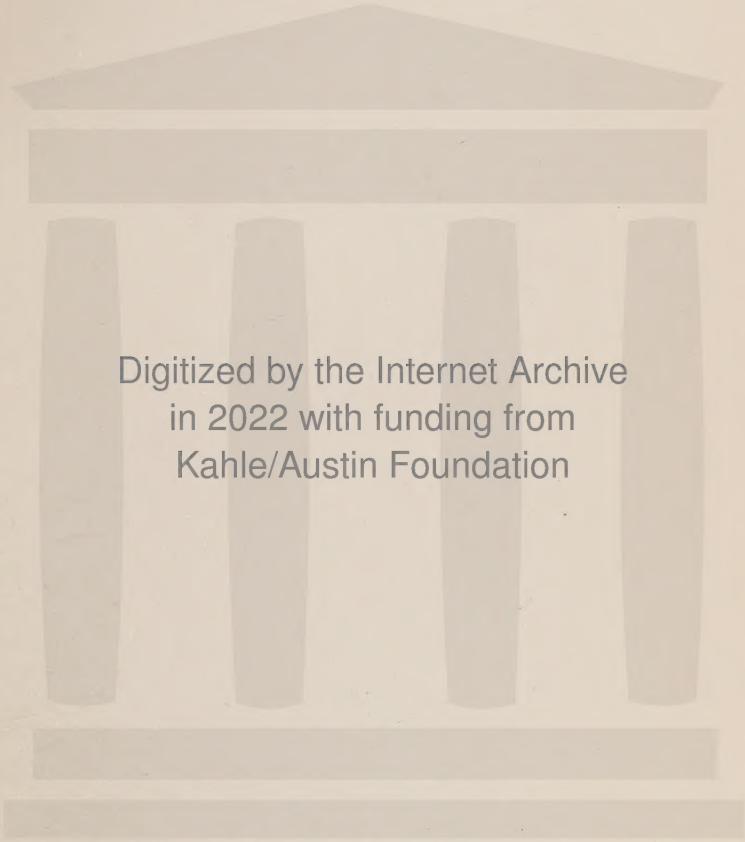
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MILLING PLANTS, BUNKER HILL & SULLIVAN CO., CAPACITY 100 TON AN HOUR

Fourteenth Annual Report

OF THE

Mining Industry of Idaho

FOR THE YEAR

1912

ROBERT N. BELL
STATE INSPECTOR OF MINES

BOISE, IDAHO, *January* 1, 1913.

TO HIS EXCELLENCY, JAMES H. HAWLEY, GOVERNOR OF IDAHO:

I have the honor to submit herewith my report as State Inspector of Mines for the year ending December 31, 1912.

ROBERT N. BELL,
State Inspector of Mines.

INTRODUCTION.

The mines of Idaho have outstripped all former records during 1912 in the matter of mineral and metal production and have again demonstrated their wonderful vitality and endurance after so many years of active production. This is especially true of our lead and silver bearing ore resources in the Shoshone County mines and at several other points in other counties of the State where this class of mineral occurs. This production has been stimulated by the active market for the metals throughout the year at fair prices which have permitted the mining of a large amount of low-grade ore that under less favorable market conditions would have to remain unmined by reason of the very small margin of profit they afford.

This is particularly true of several of our older mines, which in some instances are getting very deep and more expensive to handle in consequence.

There has been an active demand for mine labor in the producing properties throughout the State during the past year and the increased ore production, together with the increased demand for men and the employment of new hands, doubtless accounts in a measure for a number of the fatal accidents that have occurred in the mining industry throughout the State this year, which shows a serious increase over last year.

The usual causes of these fatalities have prevailed and are in most instances the result of personal carelessness on the part of the victim and might have been avoided by

a more wide-awake regard of the hazardous conditions which their employment involves.

The following table gives the number of fatal accidents, and their causes, that have occurred in the State since 1903, prior to which time no records were kept:

Fatal Accidents.

Cause.	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
Fall of rock	4	3	5	4	5	4	10	7	4	4
Explosion of blasting compounds	7	5	5	6	2	1	2	2	2	
Falling down chutes, raises and other openings	3	1	3	4	7	1	4	2	2	4
Hoisting accidents, bucket cage or skip	3	0	2	0	0	1	1	0	2	3
Electrocution, by contact with live wires	0	0	2	0	1	1	1	1	4	2
Car accidents	0	0	1	1	1	2	1	0	1	3
Tapping old workings	1	1	0	0	2	0	0	0	0	0
Caving bank in Placer mine	1	0	1	0	0	0	0	0	0	0
Suffocation from gas or smoke	1	0	0	0	0	0	0	0	0	2
Accidents in handling timber	0	0	0	1	0	0	0	0	0	2
Falling staging while drilling	0	0	0	1	0	0	0	0	0	0
Gasoline creosote tank explosion	0	0	1	0	0	0	0	0	0	1
Mill accidents	0	0	0	0	0	0	0	0	0	2
Total	20	10	20	17	18	10	19	12	15	26
Average number of men employed	7,000	6,000	6,000	7,000	7,000	5,000	6,000	6,000	6,500	7,000
Percent of fatal accidents per thousand men employed	2.85	1.66	3.33	2.42	2.55	1.75	3.33	2.00	2.31	3.71

In analyzing the cause of these fatalities this year, the falls of rock, almost invariably consisting of comparatively small blocks or slabs from the walls or backs of big stopes by reckless risks in barring down freshly broken ground, or the neglect to properly trim such places, have claimed its usual quota of victims. Contact with electric trolley wires also claimed its share. In this connection the Bunker Hill and Sullivan Company, which has very much the most extensive system of electric traction un-

derground of any mine in the district, is taking a commendable course in preventive measures to minimize the risk of life from this danger.

In the extensive ramification of the electric haulage system at this property in different levels and in different branches of the same level, the trolley wires have been cut into blocks by automatic switches that permits of killing the current behind the motor when passing out of any given section that is not to be used again for any interval of time. This system automatically throws on the current when the trolley again passes into this block.

The management of this company, with a further view of minimizing this risk, has ordered a storage battery motor which will be experimented with in the hope of being able to entirely eliminate the trolley system, whose necessary low-hung wires are always more or less of a menace in spite of all the guard rails that can be provided.

Another unusual fatality at this same property was due to smothering by C02 smoke gas settling down the main shaft from an underground fire at Kellogg Tunnel station. The victim, a young pumpman, could not be reached by 'phone, and either unaware of his danger or in a faithful effort to stay at his post and keep the pumps running on the lowest development level, overlooked his chance to escape too long, as there were several outlets from the next extensive level above him where he could have made his way entirely out of the immediate danger zone, or to an air tap, as the compressed air system was not interrupted by this fire. This serious fire was quickly gotten under control and the company is to be commended for their

splendid preparations to cope with occurrences of this kind.

This fire occurred at the main shaft station two miles underground from the portal of the Kellogg tunnel at a late hour on the graveyard shift, when there were only three men in the mine. It was probably caused by carelessly using unnecessary naked lights, as the station was well lighted by electricity, although the two men employed in the mine, in addition to the pumpman on this shift, deny this cause. The only other cause imaginable would be a defective electric wire.

As a result of my trip to the Federal Mines Safety Demonstration at Pittsburg, Pa., in the fall of 1911, this company, at my suggestion, installed a very complete outfit of Drager Oxygen Helmets, reloading tanks, pumps, etc., and trained a number of their best men in their use. With the assistance of this apparatus, and the generous support of a number of volunteers among the men, together with the old-fashioned compressed air helmet, the pattern of which I brought over from Butte to this district a number of years ago, this fire was rapidly subdued and completely extinguished within 72 hours of the time it started, with no fatalities except the unfortunte victim at the pump station on the lowest level.

This fire fighting apparatus has been installed at other mines in the district and also the Pulmotor machine for resuscitating purposes, and the Bunker Hill and Sullivan company have taken a leading part in training their men to use these devices, together with special training in "First Aid Work," and their action in this matter, as well as that of the other progressive mining companies of the district is highly commendable. This

fire was also subdued without very serious property loss, but to eliminate the chance of such a recurrence at this vital point in their extensive underground operations, this company have recently installed massive reinforced concrete lining to replace the timber at the shaft collar, main station, ore pockets, and switch station of the mine, which gives this locality the appearance of a city subway terminal. Such extremely expensive precautions, of course, are only warranted by the prospective long life of the property and would hardly be warranted in less favorable conditions of ore resources. They aptly illustrate, however, the broad-minded policy of the company in their efforts to minimize accident risks at any reasonable cost. While the danger from underground fire in metal mines is not nearly so great as in coal mining operations, they nevertheless exist, especially in the deeper extensively operated properties, which involve such a vast amount of combustible material in the form of timber to support the ground in addition to the waste rock filling which is involved for additional support of the walls when the ore is removed.

In the majority of instances, the ground is damp enough to eliminate the probable chance of fire in most of the mines. There are, however, some dry stopes and several of the underground stations are using reheated air for operating hoists, which involves the installation of the reheating apparatus, using coal and wood fires, which naturally increase fire risk, as the cost of electricity for this purpose is prohibitive. These conditions, however, have been taken care of as far as possible by the installation of sprinkling devices in the vicinity of the danger points, and this precaution will be extended wherever feasible.

Efforts are being made also to isolate as far as possible the dangerous parts of the mines into separate sections by air doors and other devices with a view of providing rescue points in case of emergency and the controlling of air currents, as owing to the confined conditions, underground fire is about the most unsatisfactory thing to fight imaginable, and while the chances from this cause of calamities are very slight they nevertheless exist and should be religiously guarded against as far as possible.

Two fatal accidents at the Ajax mine during the year were due to the premature explosion of blasting powder in an effort to spit too many holes at once in very wet ground, and were the result of an unnecessary risk run by the victims.

Another explosion accident was caused by the reckless handling of primers and powder at the Success mine. The victim was evidently punching a hole in the powder with the point of his candlestick to insert the cap and carrying a lighted candle and bunch of other primers in the same hand when the explosion occurred, resulting in his death.

At the Morning mine an experienced shift boss was drawing an ore shoot on to a grizzly in the floor of the level when the shoot hung up; he laid down on the track with his candle extended through the grizzly to see how near full the rock shoot section below him was. While in this prone position the shoot above him let go and the fine muck ran down and covered him up. He was removed shortly afterwards from under a small pile of muck with hardly a bruise on him, but life was extinct, and an effort to revive him by the Pulmoter machine operated for an hour proved a failure. The placing of a single board in the lip of this shoot would have avoided this accident, and

this illustrates the thoughtlessness of the victim, whose act in this instance was as careless as looking down the barrel of a loaded shotgun with the set trigger in a bush pile.

In the Hecla mine at Burke an unusual timber hoisting accident occurred, which proved fatal to Edward Lafferty, who was assisting in hoisting stulls at a vertical raise with a donkey engine. One of the pieces of timber caught in the slide three floors above the level, and when it was released, through the carlessness of not being dogged to the chain, as is the usual custom, it slipped off and fell from the height of three floors and glanced from the drift cap onto the other timbers resting on the short coupled timber truck that was entirely in the clear from the timber slide. Lafferty was leaning on the further end of the stulls resting on the timber truck and ten feet away from the slide when the falling timber struck, teetered the stull on which he was leaning and threw him violently to the roof of the drift, inflicting internal injuries from which he died in a few hours.

At the Hercules mine a carman lost his life by falling into a rock shoot through an opening just wide enough to admit the lip of a light scoop car which he was using to transfer ore from one shoot to another. The victim was an experienced man who had worked on this property for nearly ten years and was given this work by reason of it being a favorable job. The place was well lighted by electricity and the hole well protected by guard rails, as much as the situation would permit and facilitate the work. The victim's car was found to be off the track, and it was evident in trying to replace it without assistance he had overstrained himself and slipped and had fallen back into

the hole, or had a fainting spell, the result of undue exertion. There was plenty of assistance available in the near vicinity of his work and the accident might have been avoided by calling for help to readjust the car.

At the Snowstorm mine a surface accident resulted in the death of a millman from falling from one floor to another by carelessly leaning against a loose piece of timber which gave way to his weight and he dropped on some machinery below that caused injuries which resulted fatally.

At the Morning mill a jigman recklessly tried to cut a tangled belt that had run off the pulley without stopping the rapidly whirling machinery, with fatal results to himself.

These are the usual run of the cause of fatal accidents, which in almost every instance might have been avoided had sufficient care and caution been exercised by the victim himself.

There were only two serious hoisting accidents, due in each case to the human fallibility of the engineer in charge, which resulted in one fatality, but might have been much more disastrous, and they illustrate the necessity of throwing every possible safeguard around the work of a hoisting engineer. The most exposed men in this connection are the cagers, and it is remarkable how few of them get hurt, which is a high tribute to their alertness, mental capacity and steady habits.

The Coeur d'Alene District has been singularly fortunate in regard to hoisting accidents, considering the great depth of some of its shafts and the fact that several of their collars and headframes are located in underground stations, a long way from daylight, but this is a phase in

mining where the human element cuts a very important figure and is impossible to control beyond a certain limit of good judgment in selecting capable men of steady habits.

In this connection I would like to suggest a little amendment to our State Code of Mine Bell Signals, simply to add some rules and instruction in the use and purpose of the different bells and without changing the present code to permit additional signals to be printed upon it, but not in conflict with its present man-handling provisions.

Several of our big mines use up-to-date skip hoisting methods from skip pockets placed under the station levels.

Our code prohibits the use of private or short signals, but makes no provision for spotting the skip or cage at an ore pocket, which is generally placed from 30 to 50 feet below the station floor, and an extra bell added to the station signal is generally used by the cagers, but there is no provision for it in the code, and I shall endeavor to have introduced a bill in the Legislature to have the code amended to take care of such local demands.

The only additional precaution I can suggest against the class of accidents that have happened during the year in the Coeur d'Alene District, which might accomplish some results, would be the more stringent herding of the men and more frequent inspection of the mines. This would require provision for more financial support that would allow the employment of a resident deputy mining inspector in the Coeur d'Alenes and permit a full and thorough study and publication of the cause of each accident at the time for the educational benefit it would produce on the men.

Rigid Inspection Needed in Mines.

In this connection the following paragraph from the recently published report of the Montana State Mine Inspector is worth copying, as it has some application to Idaho conditions:

"In the elimination of the causes of accidents in mines, the personal factor is the most difficult to contend with.

"No matter how many laws for the promotion of safety in mines each mining State may enact, the mines will be no safer than before unless the officials and the men are acquainted with the intent and letter of these laws and obey them, or are made to obey them to the letter. For general safety it is difficult to frame laws that will provide for every contingency which may arise. It is desirable for the safety of all that the men employed in mines be experienced men. They only can be depended upon to obey the laws which are enacted for their own safety and the safety of their fellows, and that they have intelligence enough and have sufficient understanding of their responsibility to take precautions against accidents, even though they may not be specified in the statutes. Probably most of the men holding positions of responsibility in the operation of our mines can be depended upon to obey the laws and cope with emergencies on their own responsibility. The great danger lies in the acts of ignorant and irresponsible laborers and miners, who take unnecessary risks in defiance of law and common sense. Educating this class of men to be careful and law abiding is practically out of the question as far as the majority of them are concerned.

"If men of this class must be employed the only way to keep them from menacing the lives of the entire under-

ground force is to keep them continually under competent supervision. It is only by rigid system of discipline that any approach to safety can be guaranteed in mines where death and disaster may follow an apparently insignificant act of thoughtlessness."

Employers' Liability Law.

The Federl Company and the Hecla Company in the Coeur d'Alene District have established Accident Insurance Associations which the employees are compelled to support and the benefits they derive are largely paid by their own contributions; this compulsory insurance, however, is not fully satisfactory and does not eliminate the cause of action on the part of the victim or his dependents, unless a specific release is signed when the payments are made. The other companies of that district and of the State have no such association, but in several instances make substantial and satisfactory settlements, according to the nature of the injury or in loss of life as affecting the dependent involved.

This is a subject that causes considerable feeling between the mine owner and the employee and some serious and aggravating damage suits result.

Our present State Employers' Liability Law is inadequate and unsatisfactory by reason of the opportunities it affords for evasion on the plea of personal negligence and similar excuses. It has been used as a vote getting plank in the platform of our leading political parties biannually for the past decade and has proven a rotten piece of timber as far as any purpose it has accomplished beyond its vote getting value.

There is not any question about the responsibil-

ity of a workman in undertaking hazardous occupation, but it is a radical injustice that his innocent dependents should be made to suffer by his lack of judgment or that of a fellow servant, which resulted in his serious injury or death, and I would urgently recommend a change in this statute that would give more satisfactory and definite results and at the same time prove fair and reasonable its adjustments.

Our neighboring State of Washington has a Workmen's Compensation Act and Industrial Insurance Commission which has now been in operation for over 22 months and has given eminent satisfaction as it eliminates economic wastes in the payment to unnecessary lawyers and witnesses and casualty corporation expenses and time loss due to trials and appeals; it supplants concealment of fault in accidents by a spirit of frank study of causes resulting in good will between employer and operative; it furnishes certain, prompt and reasonable compensation to the victims of work accidents and their dependents, eighty per cent of whom have heretofore had no right to redress under common law rules; it frees the courts from the delay, cost and criticism incident to the great mass of personal injury damage suits, and appears to be the most satisfactory solution to this most vexing problem that has been developed in the United States.

It provides a method whereby one hundred cents will go to the injured workman for every dollar paid out by the employer for that purpose, and the premium rates paid by the employer are automatically adjusted to actual cost. This act applies to all hazardous occupations, and there are several that involve as serious a risk to life and limb as mining.

It is the tendency of the times, both State and National, to shoulder the cost of the industrial accidents on the in-

dustries themselves, and Idaho would be well justified in getting in line on this subject.

I have interviewed the Commissioners of the Washington Industrial Insurance Commission and they speak very highly of the workings of this scheme. I have also interviewed several employers in different branches of industry, who are also well satisfied with the law, who find it cheaper and much more satisfactory all around than the present cost of indemnity insurance, which does not indemnify, and I think there are several branches of industry in this State in addition to mining, especially lumbering, railroading and electrical work, that would endorse this law. . It would doubtless be fought by the present beneficiaries of the haphazard method of damage suit litigation and the liability insurance men and other intermediaries, but the practical application of the law is susceptible of study for a considerable period of time and with a little amendment to take care of necessary surgical and first aid matters is well worthy of the consideration of our legislators, if any change is made in this connection.

New Ore Development.

The year just closed has seen the discovery and development of some remarkably interesting and commercially important new ore channels. These new discoveries, however, have been largely confined to the old established districts of the State. Some notable disclosures have been made in the Coeur d'Alene District and in every division of it that amply warrants the assumption that this remarkable mineral field will continue to be a heavy producer of mineral for years to come.

By reason of the narrow conformity of this State at its north end, the great business created by our northern mining districts largely benefits our sister States of Wash-

ington and Montana. The further reason of this condition is that while the Coeur d'Alene District is one of the healthiest and most beautiful mining districts in the whole country, its topography of steep mountains and narrow canyons, although well-watered and richly timbered, does not afford a desirable place for permanent residence, as this wonderful mineral section occasionally displays some tragic surface moods, and its forest fires and snow avalanches have burned up or smothered more men, two to one, than have been killed in all the mining accidents in a single year, and the result is that the State of Washington, and the City of Spokane particularly, is the principal beneficiary of this part of Idaho's mineral industry in the local business it creates. This industry in Shoshone County alone employs about 5,000 men and distributes approximately $7,000,000 in cash of newly created wealth each year for labor alone in its various forms, thus affording a cash market for other lines of business and industry of a most desirable magnitude.

Virgin Mineral Resources.

The undeveloped mineral resources of Idaho contain the elements of other productive districts of this kind, and I have given considerable time and attention in an effort to advertise and bring to the notice of responsible investors the opportunities of this nature in the hope and purpose of creating similar rich cash markets for the wholesale and retail merchant, the farmer, the stockman, the real estate dealer, and other citizens of the Snake River Valley, as it is manifest that the creation of such a cash market would be the greatest stimulus to the general business progress of the southern part of the State

that could possibly be imagined, and the development of such a resource of new business is worthy of the most serious consideration and assistance of the present Legislature.

I am quite confident from a personal study of this subject, which is supported by the opinion of some of the most able engineers in the country, that we have in Idaho County and in Custer County the necessary undeveloped mineral resources in the form of gold and silver ore deposits susceptible of creating just such a cash business for Boise and other southwestern Idaho towns as the famous Coeur d'Alene District now affords to our northern neighbors.

As a preliminary, however, to the establishment of this condition it is almost essential that the State substantially assist the consummation of this desired remedy for present sick business conditions by making these new districts more accessible and attractive by additional State Wagon Roads construction.

Being a small taxpayer myself and making an annual tribute of over $6.75 per acre on a small tract of unproductive fruit and pasture land for State and county purposes, I fully appreciate how difficult it is going to be for the Legislature to provide ways and means to indulge in additional State expenditures of this nature, unless it can be done by bonding and transferring the ultimate settlement of the obligation created to the population of the future, who are to be benefited by the maximum results of this outlay, but I firmly believe that just as big a business can be created in the Big Creek Mining District, in the southern part of Idaho County, by a fuller development of its magnificent ore resources, as is annually produced by

the mines of Shoshone County, and whose business benefits could not get away from the southwestern towns of Idaho and their agricultural interests, and also those of the Lewiston and Salmon City sections when the Gilmore and Pittsburg Railroad is completed through the canyon of Salmon River.

Big Creek Wagon Road.

The Big Creek District at present is so remote and inaccessible that it is very difficult to get substantial capital to consider its possibilities.

This district has now a makeshift wagon road from Payette Lake by way of Warren and across the South Fork Canyon. This road, however, although it presents one of the best engineering feats in the State for easy grades, considering the rough country and high elevations it covers, is a little better than a good trail and impassable for heavy loaded wagons, by reason of the lack of funds supplied for its construction. The completion of the Idaho Northern railroad to Lardo gives a much better point of access to the Big Creek country over much easier grades and lower elevation with a maximum of 7,000 feet as against 9,000 feet over the present route, which would extend the hauling season fully two months and afford a feasible winter road that could easily be kept open and would greatly facilitate the accessibility of this rich mineral field.

This southern route to this district would leave the railroad at Thunder City in Long Valley, pass over the present Roosevelt road to the crossing of Johnson Creek, a distance of 40 miles. To put this piece of road in shape for heavy hauling would not require an outlay exceeding $2,000.

From Johnson Creek to Edwardsburg, the postoffice center of Big Creek District, a first class wagon road can be built for $25,000 by way of Yellow Pine Basin and Profile Creek on very easy grades. This, I believe, is one of the most necessary and important pieces of road construction required in Idaho looking to the general prosperity of the State, which would inevitably result, by making more attractive and accessible the wonderful ore resources of this region, in addition to which it would connect with the northern road at Edwardsburg, which has been built by the State and private parties and would afford a vent for a vast area of idle natural resources, which would prove a most valuable asset to the State in the creation of new business, as the resources of this section of the State are of such a definite nature in both timber and mineral as to warrant the prospect of building up a labor market worth ten million dollars per year, for in addition to the great volume and variety of its mineral deposits, this particular region carries billions of feet of yellow pine and pulp wood pine, which is also pregnant with profitable business and traffic possibilities.

Payette Wagon Road.

Another section of the State which should be made accessible by additional wagon road construction, to make more available and attractive its wonderful mineral resources and scenic beauty, is the construction of a State wagon road up the South Fork of the Payette River and Warm Springs Creek to the Sheep Mountain, Seafoam and other neighboring rich mineral districts on the headwaters of the Middle Fork of Salmon River, where it would connect with the excellent wagon road system of the main

Salmon River, extending to Montana, and would attract thousands of money-spending automobile tourists annually to its famous summer resort features of Alpine scenery and lake sections, in addition to facilitating the further development and operation of its great variety of demonstrated mineral deposits, whose immense tonnage only awaits the magic touch of mining capital to make them a great tributary source of local business profit.

This route has been surveyed by a committee of interested business men, who have received considerable assistanc and encouragement in the matter from the Forest Reserve officials, and it is considered that this road can be constructed in a very substantial manner by an outlay of $50,000.

Any work of this nature which is undertaken by the State should be put in the hands of competent engineers, and should be done in a substantial manner that would afford permanent highways easily kept in repair. A large proportion of the money that has been already expended on State wagon roads has proven of very little value to the State by reason of the fact that too much ground was covered for the amount of money appropriated, with the result that poor, narrow roads were made that have proven of very little use or value, but I know of no outlay of State funds that can possibly bring higher results to the general welfare of the people of the State at large than the construction of first class highways into the heart of these immense areas of interior mountain territory, which are so potentially rich with industrial possibilities.

Retrospective Review.

The mineral industry is the primary industry of Idaho,

as it is of the whole series of Rocky Mountain and Pacific Coast States.

It has laid the foundation and has done the trail blazing and rough pioneering work that has made all the other industries possible. It can justly claim credit for the principal architectural achievements of the numerous important business centers of the West.

It made possible the rapid resumption of specie payment after the civil war, which started this country on a sound basis of financial credit and commercial glory.

"The gold and silver dug from the hills of our neighboring State, Nevada, financed the first trans-Atlantic cable, which established a whispering gallery around the commercial world," and mining is today one of the most important factors in the business life of the whole United States.

The trouble with the mineral industry in Idaho is the lack of faith and the lack of appreciation of the permanency of our ore deposits, and yet after fifty years of a continued output of precious and useful minerals this State, in the year of Grace 1912, after a series of years of continued increase, has made a record-breaking output of mineral values, which, with our vast areas of virgin mineral territory, should be sufficient evidence of its vitality and possibilities for further expansion.

State Mineral Lands as a Probable Source of Revenue.

The running expenses of the great commonwealth of Minnesota are very largely supplied by small royalties derived from the leasing of its State lands for iron ore mining purposes.

Idaho has a mineral resource that is far more essential to human happiness and far more extensive from a tonnage standpoint than the phenomenal and highly profitable iron ore resources of Minnesota, a mineral element that is so essential and enters so largely into the physical structure and well being of all living things as to form the principal basis of "The Future of Man in America," this quotation being the title of a work written by a high authority on the subject, which was put forth as an argument by our leading conservationist of 8 or 10 years ago, who proposed invoking the Federal constitutional prerogative of prohibiting the shipments from this country of this element by reason of the fact of its limited extent and manifest early exhaustion at the rapid rate of increase that the known deposits were then being drawn upon.

This vital element is phosphorus, and occurs in nature in the form of calcium phosphate, a natural combination of lime and phosphoric acid that enters very largely into the substance of flesh and blood and bone through the medium of plant growth, and a deficiency of which in the food of animals, including mankind, results in their rapid physical impoverishment and final disintegration.

Within the past eight years, as a result of the personal advertising efforts of a foreign mineral corporation doing business in California, this mineral was discovered in Utah and Idaho, which discoveries have since been extended into Wyoming and Montana and now exhibit the most extensive resource of this important element that has ever been discovered in the world and puts the United States beyond any shadow of fear of exhaustion of this important substance for all time.

These phosphate fields as far as surveyed find their rich-

est manifestations in southeastern Idaho, where Government experts have outlined the existence within easy mining distance of the surface of several billion tons of this most valauble mineral in this State alone.

The great success and prosperity of the different States of the Union are based entirely upon their natural physical advantages and resources, whether it be harbors, rich soil areas, timber, or mineral resources of various kinds that nature has endowed them with, and there is no moral or just reason why Idaho, with its limited population of overburdened taxpayers, should not be given the benefit of any natural resources of this kind, when to do so could only affect the general population of the whole United States beneficially.

When these Idaho phosphates were discovered and a limited area of them were taken up under the existing mining statutes, and under the most expert legal interpretation of them that could be bought, the Federal Government immediately proceeded to withdraw from public entry all the areas of the States suspected to contain this valuable mineral, and instead of presenting an irrevocable title to the people who are responsible for the original discovery of this wonderful natural advantage to our national success, the Government has thrown every possible obstacle in their way in their efforts to obtain clear title to their limited claims, and recent judicial rulings of its higher courts, against the advice of its own technical experts, trained and highly supported in the determination of such scientific and statutory matters, have recently practically wiped out or muddled their titles to such an extent on a technical point in the law against a predominant wording in their favor as

to disgust these people and their American neighbors with our judicial interpretation and unfair department rulings on such matters, which have put the pioneers of this industry at the mercy of "Johnny-come-lately" jumpers under our silly lode law and practically destroyed their business.

The Enabling Act which gave Idaho admission to the Union as a State conveyed with it the implied purpose of giving the State a chance to work out the ultimate control of its entire territorial area, with the exception of very limited Federal institution reservations.

In this connection, however, the results of the retroactive conservation policy of the Government, which have since been enacted and bureaucratically applied, has put the great Government of the United States in the position of an Indian giver with a strong string on its statehood gift with which has been yanked back to absolute and apparently irrevocable Federal control over one-third of our total State area in Federal withdrawals and reservations of one kind or another.

A recent deal between our State authorities and the Government authorities at Washington propose the transferring of our scattered school sections throughout the State for larger and more compact bodies of land. One of these trades involves the transfer of a large area within this rich phosphate field in the southeastern counties of the State, and in that trade, and in passing other State land titles, the Government proposes to reserve the mineral rights under the surface, which is an unwarranted exaction in the transaction and a dog-in-the-manger policy which should be strenuously objected to by our State authorities as there is no reason why such an

exhaustless resource of mineral as is now demonstrated to exist in these phosphate fields in Idaho alone should be withheld from the possible benefit it might produce to this State, and if there is any real virtue in the word "Commonwealth," this resource is a natural inalienable common wealth of the people of Idaho and should be given to them for their use and benefit to the extent of a billion tons or so at any rate, which would still leave the Government enough of a hold-back within our borders alone to satisfy the wildest dreams of its extremest conservationist, and our Legislature should memorialize Congress to this end, and is successful in clearing our natural title to these valuable mineral deposits, our State authorities, through practical demonstrating experiments in the use of this mineral in increased crop production, especially wheat, at our agricultural experiment stations, should advertise and demonstrate its virtue and create a market for it, with the ultimate object of deriving a limited per ton leasing tribute from its production and an expanding source of State revenue that would greatly relieve our present serious tax burdens, besides facilitating the mining transportation and increased agricultural business and production in other States its extended use would result in, as there is plenty of eminent authority to show that its liberal distribution will give eminently profitable results, and its liberal use will benefit the whole United States at large, while its idle reservations under present conditions is doing no good whatever.

Taxation of Mines.

The subject of mine taxation is being again agitated and officially recommended for further tribute and tax burdens

which are already as heavy as any industry in the State bears, and if an attempt is made to value our profit sharing mines on their gross ore resources for taxable purposes, the move would simply result in vanishing ore reserves and a definite embarrassment to the legitimate mining practice of keeping ore reserves well blocked out ahead of milling requirements. In fact, this agitation has had a definite effect in this respect already.

The dividend paying mines in Shoshone County, in connection with other corporate holdings, now pay 87 per cent of the total taxes collected for State and county purposes in that county. The profit paying mining operations not only pay the varied assessments on all forms of their property like other taxpayers, but also pay additional tribute on their dividends or net operating profits, which in some instances is really an income tax that no other industry in the State is called upon to contribute.

Our largest mines are in several instances unquestionably profitable business institutions, but their success has been built up after inordinate risks of cash capital. They are paying as high a tribute in taxes under present methods of assessment as are the other leading mining States of the Union.

Their profit margin per ton is small, but their permanency, magnitude and aggregate output is one of the strongest advertising features that the State has, and is of world wide value, and it would be unwise to frighten away capital that we are so badly in need of for our undeveloped mineral resources by unjustly overburdening our few successful examples of this class of investment, and, before adding to their burdens, I think it would be only just to consult with representative operators on the matter and to look into other sources of revenue.

I have before me as I write two specimens of mineral; one is a piece of copper malachite ore, its chemical formula is 2 CuO. CO_2. The second one is a glass of water consisting of a combination of hydrogen and oxygen gas in liquid form and containing an appreciable amount of impurities, consisting principally of alumina and silica, and its chemical formula is $H_2O + H_2Al$. and it is just as essentially an inorganic mineral substance as the first one and enters largely into the composition of most ores.

The first specimen is from an Idaho copper mine in one of our central counties on which there has been expended fully a million dollars for labor alone in the hope of big dividend returns, but the investment has proven a disappointment after years of effort and so far has not paid a nickel in profit.

The second specimen is a liquid mineral that runs in the channel of Snake River, and other streams of the State, a natural State resource that is simply stopped by dams and equipped by machinery, after which it automatically transforms itself into power which sells to the citizens of Idaho at a profit of from $20.00 to $100.00 a horse power a year over development and distributing cost.

This substance does not involve the gruelling capital risk and uncertainty as does the solid mineral business, with its necessity for expensive tunnels, shafts, crosscuts, raises, drifts, pumping and hoisting costs and intricate ore dressing plants required to trim it up for a narrow margin of marketable profit, but runs free and untrammeled to its point of use with absolutely no cost whatever beyond the installation of the necessary plant to transform it into electric juice and wire it to the point of use, and this complete equipment does not exceed the varied

and necessary mechanical equipment involved in some of our big mines in actual cost, while it forms the basis of enormous capitalizations and profits and is a natural resource the high profit creating use of which should pay a further tax tribute more logically than should the already highly taxed and hard earned mineral of the miners, and instead of adding further to the miners' burden in this respect, I hink these institutions of our State which are rapidly increasing in number and in notable instances have assumed arrogant sway over other long established property rights, should be given serious consideration as an added source of revenue, as they are using a natural mineral product that is costing them absolutely nothing to mine.

Federal Mining Law.

The present application of the Federal mining statutes, in an effort to apply them in their strict letter rather than their spirit, as a result of the National conservation policy agitation, is working a serious hardship on the mining industry of the whole West, and I think all mining men should take an active interest in their revision, as their present application and rigid misinterpretation is an absolute embarrassment to the progress of the mineral industry.

The apex law is so unjust and indefinite as to cause constant grief and friction. We have three splendid new productive ore bodies in the Coeur d'Alenes that are hopelessly tangled up with recent apex litigation, which, besides being extremely costly, involve some hairsplitting conclusions and scientific deductions that no court in the land is capable of justly deciding, and it is high time that

this statute be repealed for the benefit of future locations, as we are behind fourth rate powers in matters of this kind.

Our general lode location law needs further revision, as it is possible from the wording of the statute to apply its meaning to either lode or placer deposits, greatly to the detriment of important titles to extensive mineral deposits in this State, and it is the subject of expensive and serious litigation in this respect, while the present exacting departmental construction of the discovery feature of the law is absolutely silly from a practical mining experience standpoint.

Federal Persecution.

Under the direction of the Secretary of Agriculture we have lived to learn some of the benefits of Federal Forest Reserve supervision work. Efficient resident western officials have developed an intelligent understanding of their duties and are doing excellent work at many points, but the undue action of special Government agents outside of forest reserves under the direction of the Interior Department in finding lumber values in scrubby growth of desert brush wood, like mahogany and juniper, and putting up a claim for material of this kind which has been used for fuel and mining purposes by one of our oldest mining companies and their dependents in Owyhee County during the past twenty years, and paid for at very high rate by that company to the local wood rustlers of the community, seems to me to be a very unjust and unwarranted proceeding for a beneficient Government to undertake, and in sharp contrast to the former liberal policy of the Government towards the mining industry, so well remembered

by all the old residents of the West, and which has done so much towards transforming the western desert wastes and barrens of Webster's day to a veritable paradise of varied natural resources.

This case involves a claim by the Government against the DeLamar Mining Company of Owyhee County, whose product is exclusively gold and silver and whose business will be destroyed if the present excessive duplicated claim of the Government for the recovery of the full value of all of this scrub wood they have used during long series of years past is maintained.

This mining enterprise has produced upward of ten millions of dollars of bullion, mostly gold. It has been operated for a number of years past on a very narrow margin of profit and is so situated that the cost of hauling fuel from the railroad is prohibitive.

It has an extensive territory and is following an expensive plan of new development every year in the hope and prospect of reviving the former glory of its original bonanza ore deposits, lost by faulting.

That the Government should strike at one of its steady sources of supply of its vital new money metal on such a flimsy duplicated and morally outlawed claim as this seems hard to understand, and its action is in sharp contrast with the other Governments in this respect, especially the British Government, who fought one of the most sanguinary wars of its history for the purpose of acquiring sovereignty to a little two by four patch of land in a corner of the Transvaal solely for the purpose of controlling the gold supply it contained, and the liberal policy of that Government in many other respects towards its mineral industry could be profitably copied in this country.

The inadequacy of our present Federal mining and other land statutes has been shown up in the reports of our present Secretary of the Interior, Mr. Fisher, and if anything can be done by our legislators to encourage early action on the subject of their revision and subsequent rational administration, certainly it should not be overlooked. In spite of its limited population Idaho has contributed examples of statesmanship to the highest council of this nation that compare favorably with the contributions to that body of the oldest and most populous States, and the quality of the candidates that are seeking to perpetuate this national tribute should be religiously analyzed before a decision is arrived at by our present Legislature, and I think party lines could be profitably set aside and a wire campaign be undertaken with other Western Legislatures now in session, with a view to a combined demand for recognition from the new President of the appointment of a Western man to the Interior department portfolio from among the able men who are now aspiring for the position in this and several other Western States, embracing one of the largest regional subdivisions of the nation and whose interests are so specifically affected and concerned by an equitable and intelligent administration of the affairs of that department.

Boise Assay Office.

The United States Assay Office at Boise in connection with other branch offices of the same class and other local Federal departments, has been the subject of discussion frequently of late with a view to their discontinuance, in pursuance of the Federal retrenchment policy.

This efficient and well administered little institution

is not only an object of patriotic pride but has proven of the utmost benefit to the mining industry of Idaho. Its maintenance cost is very moderate and it could be well maintained for the patriotic benefit, as well as the business convenience it affords, as a settling point for the producers of gold bullion.

Idaho's output of the vital money metal of the world has already aggregated $300,000,000, largely from surface placer deposits, and while our present output is not so large as formerly it has shown a gradual increase for several years past and is susceptible of a rapid advancement in the future from our extensive and partly demonstrated primary resources of gold ore.

As an example, we have a recently discovered ore deposit tributary to Boise on which a report was made by one of the most conservative and capable authorities in the country in which an investment of $2,500,000, largely for mill construction and development, was recommended, that proposed a milling capacity of 3,000 tons daily of ore that shows an average of $4.40 per ton and on which tests indicate a recovery of $4.00 per ton, with a tonnage resource that promises to last for years at this rate of production.

This deal has not yet been consummated, but is likely to be perfected in the near future. This is only one of a dozen similar prospects of new gold supply which this State contains.

Millions of dollars have been invested in Alaska and other ore deposits recently that average only $2.00 per ton by successful engineers and mining capitalists. The future gold supply of the world must come from ore of this class, and Idaho is in line to become one of the chief

sources of supply, and its Federal Assay Office will stimulate this line of development, as it saves the risk of long bullion shipments and gives immediate and satisfactory results by the Federal endorsement of its business, which are conclusive, and amount in effect to stamping the coin eagle on the gold and is highly appreciated by the producer, besides keeping him in closer touch with and respect for the central Government.

A great deal of public money is annually spent in pure display and patriotic purpose by all governments, and it seems to me that it would be an unwise policy to eliminate such branches of Federal authority as these in the gold producing regions of the Nation, as they are a good deal more than self-sustaining if the seigniorage on the silver bullion they separate from the gold is taken into consideration, and their specific purpose in assisting in the discovery and disposition of new gold and the consequent expansion of the basic credit of the Nation is well worth the paltry cost of their maintenance without taking into account their seigniorage profits.

To eliminate these and other little agencies and evidences of Federal authority in the Pacific States and supplant them with a superflous army of plain clothes men, whose specific purpose has tended to harass and retard our general development progress, exhibits a decidedly discriminating sectional spirit and rather tends to weaken our regard for centralized Government.

There may be method in our present Secretary's purpose and special agent work to rub in to the the limit the stringent application of the laws and rulings pertaining to mineral and other land titles in which the Federal Government is concerned, which is now so seriously affecting

the development of the natural resources of the West, with a view of hurrying their revision, this part of the country has certainly been hard hit in recent years in this respect.

The Pacific Coast States have the Atlantic Coast States backed off the map by comparison in matters of physical aspect, climate, variety of natural resources, and a desirable place in which to live, which, together with their magnificent harbors and great western world front advantages, are susceptible to maintaining a similar teeming population as our Eastern Coast States now boast, and it is high time this great section of the United States gets together through its representatives at Washington and demand a stronger voice in the Federal administration of their local affairs and the amendment of laws that will remov the present embargo on Western progress.

State Geologist.

Another movement is on foot which would afford a very valuable lever in the development of our natural resources, and that is the creation of a State Geologist, and a bill will be introduced in the forthcoming session of the Legislature for that purpose, involving a very moderate appropriation for its support.

I heartily endorse the establishment of such a department and official in Idaho, as this State is one of four remaining States in the Union that does not provide a department of this kind. Such a department would provide the means for a more thorough and scientific study and exemplification of our varied inorganic resources, and should be attached to the Mining Department of the State University. It could be made of the utmost value to the farmer and manufacturer as well as to the miner, espec-

ially in the matter of soil surveys, and maps of same and the determination of their chemical composition and adaptability for different crops, in the outlining of the existence of artesian basins, in the encouragement of manufacturing enterprises, in the utilization of the great variety of building materials which our surface formations afford, as well as for the purpose of determining the values of the rarer mineral elements and substances of commercial worth with which our State abounds, and especially to promote the utilization of our vast resources of fertilizing mineral and our important coal deposits.

These subjects require scientific study and survey, and in my official capacity I have constant calls from outside investors for geological maps of the State and of the various districts of the State and for the chemical determination of minerals which I am unable to supply.

An instance of recent occurrence is worth reciting in this connection:

Some Idaho business men were seeking capital in Kansas for the establishment of a pressed brick and fire brick plant at American Falls, claiming special merit for their raw material, but were refused the privilege in that State by the Blue Sky Law of Kansas, by reason of the lack of proper official or technical endorsement of the virtue and extent of their raw materials. A Geological Department would help take care of cases of this kind, and if supported by a moderate annual appropriation I believe would prove a very valuable asset to the State and an educational adjunct to the Mining Department of the State University at Moscow, where, under a competent official, the advanced students of the Engineering Department could get a lot of practical experience and render

valuable assistance in field work and mapping during their summer vacation period.

Such a department would involve the necessity of a good deal of chemical work and analysis, the apparatus and means for which are already provided by the splendid equipment at the University, which is also supplied with some excellent technical talent in the Mining Department heads, where a very efficient man would be available for the position to be thus created, and it is not unlikely that a source of revenue may be developed from a more thorough study of the State's extensive land holdings through such department that would relieve the taxpayer and might ultimately take care of the bulk of its financial requirements, as does the mineral resources of Minnesota.

Mining Stock Investments.

The following review of the mining progress of the State by counties is the result of personal inspection during the year and the most reliable source of information on the subject covered.

I find it impossible to get over all the mineral districts of the State, for, as a matter of fact, practically every county in the State contains mineral resources of merit that are worthy of study and encouragement, but it is too big a field for one man to cover without assistance, as there is a great deal of office work and correspondence to attend to which requires a lot of time at headquarters in Boise.

I try to give special prominence to the most attractive and probable sources of profitable new ore bodies that the State affords, and do a great deal of special press advertising in this connection.

I, of necessity, occupy a rather dual position as special advertiser and critic of mineral development enterprises, which occasionally puts me in a rather embarrassing position. People who are trying to raise capital for mining development from the sale of treasury shares are frequently too optimistic of results and make decidedly rash promises of profits to be expected from an investment of this kind. Such weakly capitalized enterprises, deriving their money from the sale of cheap shares to poorly informed people who can ill afford to lose money in such ventures, which seldom get anywhere in the matter of making profitable mines, although there are a few notable exceptions to this outcome in Idaho.

Promoters frequently take undue advantage of the relative position of their properties, claiming them able mines. Promoters frequently take undue advantage of the relative position of their properties, claiming them to be the extension of some well-known producer without any close regard to the facts of the situation, and when they fail to make good on their rash promises with results, they get tired of answering the inquiries of their patrons, who in turn revert to this department for information, and there is usually not much of an encouraging nature to tell them, but they have invested their money, which, while it may amount to only a few hundred dollars, seems large to them, and in many instances produces some pathetic appeals for advice and relief, sometimes involving from me a statement of plain facts which frequently hurts the feelings of the parties involved at both ends of the line.

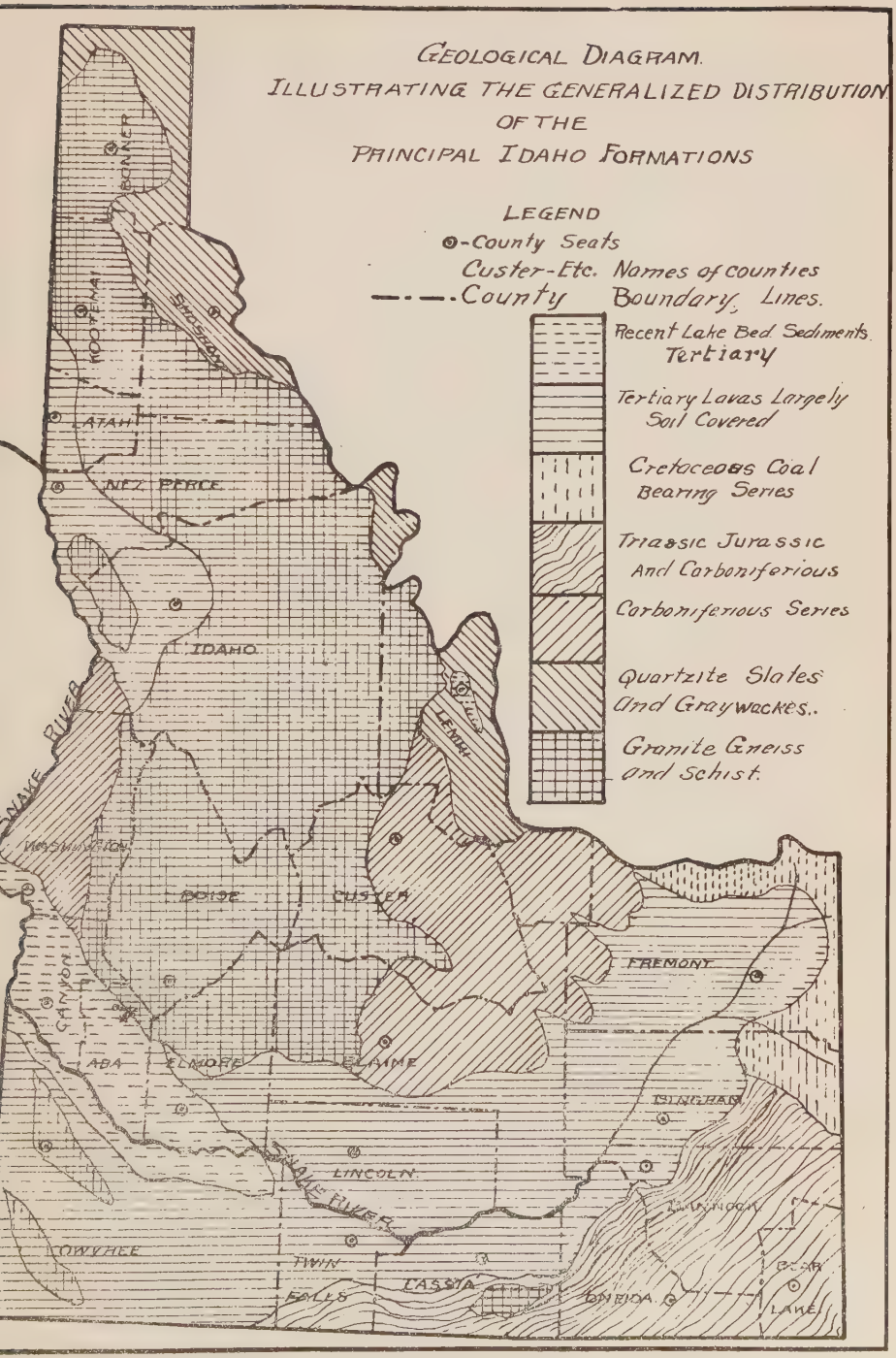
Mining investments should be religiously avoided by people of small means as it is a business for the financial-

ly strong, and no one should buy mining stock in a development enterprise of unproven merit who is unable to stand the loss of the investment without injury to his or her current business, and for the protection of this class of supporters of the mineral industry an addition to our present mining laws requiring a brief annual statement of development progress and financial resources of mining development companies would be advisable, for while there is nothing that pays such high financial returns as a well-advised mining investment, there is no other line of business that involves a greater capital risk when undertaken without a proper regard of all the natural difficulties involved.

Economic Geology of Idaho.

The accompanying geological diagram, illustrating the generalized distribution of Idaho's principal formations, is made from a personal knowledge of the State in this connection together with the assistance of what public maps are available from the United States Geological Survey and is only intended to convey a very generalized idea of the subject.

Some detailed mapping of the different districts would afford an invaluable guide to their further development. The Government report, for instance, on the Coeur d'Alene District is a classic of its kind and has proven a most gratifying guide to the prospector, the investor and operator of that field, and is a remarkable tribute to its author's insight and detailed classification of the Coeur d'Alene formations, and their relation to the genesis of the ore deposits, and while there is some variation of opinion on that


GEOLOGICAL DIAGRAM.
ILLUSTRATING THE GENERALIZED DISTRIBUTION
OF THE
PRINCIPAL IDAHO FORMATIONS
LEGEND
⊙-County Seats
Custer-Etc. Names of counties
—·—·—.County Boundary Lines.
Recent Lake Bed Sediments.
Tertiary
Tertiary Lavas Largely Soil Covered
Cretaceous Coal Bearing Series
Triassic Jurassic And Carboniferious
Carboniferious Series
Quartzite Slates And Graywackes..
Granite Gneiss and Schist.
BONNER
KOOTENAI
SHOSHONE
ATAH
NEZ PERCE
IDAHO
LEMHI
SNAKE RIVER
WASHINGTON
BOISE
CUSTER
FREMONT
CANYON
ADA
ELMORE
BLAINE
BINGHAM
LINCOLN
SNAKE RIVER
LEMHI
ONEIDA
CASSIA
TWIN FALLS
OWYHEE
BEAR LAKE

subject, it aptly illustrates the value of work of this kind in mineral development.

This State is now enjoying the benefit of some additional work of this kind from the United States Geological Survey Department, who have had a small party in the field for the past three seasons in the central eastern counties carrying out a generalized study of our geology and ore resources, who urgently encourage the assistance of the State in this work, as a State Geologist could render valuable assistance in the complete mapping of the various economic resources of the State, many of which are so closely allied to the farming as well as the mining industry and to our other branches of business progress.

In the nature and proportion of its rock formations, Idaho compares more closely with Colorado and California than with other States. Its principal feature being its enormous development of granite formations and extrusive lavas, which, together with the included alluvial areas of the latter, occupy fully seven-tenths of the total area of the State.

Of much smaller extent than either the granite or lava formations, but at present of much greater economic importance in the way of metal resources, is the limestones and ancient metamorphic sediments, which occur around the margins of the great central granite areas, especially in Bonner, Shoshone, Lemhi, Fremont, Blaine and Custer Counties, with detached areas in other counties around the margin of the main and isolated granite islands.

The great central granite mass of Idaho has been classified by authorities as belonging to various geological ages, ranging from the archean to the cretaceous. The consensus of opinion among the most recent students of the

subject attribute its age to the cretaceous period, and its classification to a variety of eruptive granite or quartz monzonite that occurred as a batholith, absorbing and folding the overlying ancient sedimentary rocks that formerly were of much greater areal extent than at present, as vast areas of these formations, as well as of the upper horizons of the granite batholith itself, has been removed by erosive processes. It is computed that as much as 10,000 feet in elevaton of the surface of Idaho in its higher altitudes have been denuded since the close of the cretaceous period. This vast erosion of rock formations, with their contained ore deposits, has resulted in giving Idaho its past and present prominence as a source of placer gold, with an aggregated output to date, since our placer deposits were first discovered, conservatively estimated at two hundred million dollars.

At Poverty Flat, in Custer County, there is an old table mountain with a surface as flat as a floor over quite an extensive area that is made up of steeply folded ancient sediments, presenting an old erosion surface that now has an elevation of nearly 10,000 feet above sea level. The Snake River Valley is a profound earth sink formerly occupied by a lake that is filled with granite sediments of sand and shale, together with recent lava flows. These disintegrated granitic sediments still retain their micaceous elements and are known to be over 4,000 feet deep below the present floor of the valley, as penetrated by an oil well drill at Ontario, without finding bottom.

These are two features that give a partial explanation of the theory of the deep erosions of Idaho's formations.

The result of this natural mining process has been twofold; it released the gold from the quartz veins and made it

readily accessible to the placer miner, but at the same time it destroyed the parent source of the gold by this process of erosion and in many instances left nothing but the shallow roots or stumps of former ore deposits. The granite area of Idaho, however, has been extensively intruded by recent tertiary eruptions and accompanying ore deposits, including bonanza values, and some of them of great magnitude and exceptional promise when looked at from the standpoint of low grade ores to be utilized in vast quantities on narrow margin of profit per ton. These deposits belong to the same age of relatively recent ore occurrence as has produced such famous results in Colorado and Nevada during recent years, and in this State presents some very attractive possibilities for the investment of big mining capital.

"The topographic features of Idaho are the drainage system of the Snake and Columbia Rivers with a vast arid plain in the former stream across the full width of the State at its south end, with some prominent mountain uplifts and desert plateaus separating it from the great basin on the south, while north of the Snake River, extending to the British Columbia line, is a labyrinthian mass of mountains and canyons without any definite range system, consisting of a deeply eroded broad plateau, remanent evidence of which are left along the western border of the State where important areas are in the humid zone and produce rich agricultural crops without irrigaton," while the arid Snake River plains, with their great central river and rich soil surface afford the finest natural conditions for extensive irrigation enterprises which have been undertaken during years, covering several millions of acres and susceptible of supporting a million people.

From the bold uplifts along the northern rim of the Snake River Basin the mountains are heavily timbered through to the northern extremity of the State and contain some magnificent stretches of yellow pine, black pine, white pine, red fir and cedar timber, that will support extensive lumber industries for years to come.

The extreme elevations of the State range from 800 feet above sea level at Lewiston to a cone-shaped peak of eruptive granite of 13,000 feet above sea level called Castle Peak, in the rugged aggregation of sharp summits, known as the East Fork Mountains, that form an offset of the Sawtooth Range in Custer County.

Elevations of from eight to ten thousand feet are quite common over the southern, central and eastern parts of the State, especially along the Continental Divide, which forms a portion of our eastern boundary line, insuring a big water supply, but the general elevation of the numerous ridges and summits which separate the deep-cut canyons over the central and northern portions of the State are very much lower and fall away quite rapidly in the direction of the drainage to the west, affording steep grades for numerous large streams and in the aggregate an immense amount of valuable water power susceptible of economical development.

The soil areas of the State of Idaho are almost exclusively derived from the composite crystalline igneous rocks that prevail over the greater portion of its valleys and plateaus, which accounts for its extreme fertility, as these formations are rich in the basic elements of vegetation, and particularly so in the most important elements of plant food, potash, phosphates and nitrates.

In our southeastern counties a very extensive shore line

of middle carboniferous limestones and shales has been outlined by the Government Geological Survey, forming a part of the most extensive phosphate field ever discovered in the world and containing within the borders of this State, as already outlined, a resource of rock phosphate 70 per cent pure, or better, in beds as regular as coal veins, 3 to 6 feet thick, that already discloses a minable resource of this valuable mineral amounting to several billions of tons that should ultimately prove a great factor in increasing grain production of other States when its virtue in this connection is more fully advertised and demonstrated.

In Fremont and Bonneville Counties we have a rich though limited area of the rich coal bearing cretaceous formations from the Laramie horizon down that have been demonstrated to contain some very important domestic coal resources in veins from 5 to 10 feet thick of coal fully equal to anything now imported from other States.

The great source of our lead silver ore production of the present time is from the pre Cambrian sediments of the Coeur d'Alene series, consisting of fully 20,000 feet of metamorphosed slates, sandstone and shales, the whole sharply folded and faulted, and intruded by narrow dikes of basic igneous rocks and some irregular masses of quartz monzonite that is supposed to be related to the great central granite masses of the State and to be intimately associated with the origin of the ore minerals.

Next in importance as lead-silver and copper ore producing formations are the ancient paleozoic sediments that overlie the Cambrian quartzite and range through to the middle carboniferous limestones. These formations are extensively intruded with igneous dikes, as exempli-

fied in the mining districts of Lemhi, Custer and Blaine Counties, with limited areas in Washington, Adams and Owyhee Counties.

These formations have produced some notable ore deposits, whose development has not been very extensively undertaken since silver declined by reason of their remoteness from railroad transportation in many instances, and contain some splendid possibilities for further development of this class of mineral, as evidenced by the important production of fine smelting ore that has been made by the revival of interest, warranted by closer railroad facilities during the past few years at Gilmore and Mackay.

Rare Metals.

Idaho is noted for the occurrence of the rarer metals and minerals, and, while this branch of our mining industry has not yet received much attention, the prospects of profitable mining operations of this kind, especially in connection with gold placer operations, is of no mean importance.

Monazite.

This mineral, containing the valuable rare oxides of thorium, cerium, etc., is very prevalently disseminated through the old placer gravel beds of central Idaho, particularly in the Boise Basin, Long Valley, Rock Flat, Resort and Warren Districts.

This mineral occurs as yellow sand in about the same proportion as the black magnetic iron sand occurs in most other placer diggings. It is derived from the disintegration of the granite formation, and is also found in small quantities in the gold quartz veins that traverse these districts.

Cobalt and Nickel.

These metals occur in association with the copper ores of the Blackbird District in Lemhi County, and with the gold-bearing iron sulphide ores of Washington Basin in Custer County, and also in association with copper iron sulphide minerals in portions of the Big Creek District. Like similar deposits in Canada, several of these deposits show conspicuous association of pyrrhotite ore, and other pyrrhotite deposits in the State are worthy of analysis for this more important mineral association.

Tungsten.

This mineral occurs in lenzy quartz-filled fissure veins in diabese schist at Patterson Creek in Lemhi County, where some extensive development work has been done and a milling plant of 100 tons daily capacity is now being erected.

Tungsten in the form of sheelite ore occurs in bunches in the large quartz veins in the Golden Chest Mine at Murray in Shoshone County, and in the Golden Winnie Mine in the same district.

A high grade sheelite ore is also reported from the Charity Mine at Warren, Idaho County, in association with a narrow gold-bearing quartz vein in granite, and a recent discovery of clean tungsten ore is reported from Blaine County, near Arco, from which fine specimens have been received at this office.

Tin Ore.

High grade stream tin ore, carrying 65 per cent metallic tin, is found associated with gold bearing placer gravel at Panther Creek and Silver Creek, in Lemhi County.

Samples containing important tin values are also reported from a quartz vein near Salmon City, associated with gold, lead and vanadium minerals.

Mercury, Platinum.

Cinnabar ore has been found at several points in the State, especially as pebbles in the placer gravels of Stanley Creek, where pieces up to several pounds in weight of cinnabar ore, containing 60 per cent mercury, have occasionally been found in the clean-up box of a dredging operation, associated with other rare minerals, including metallic platinum.

At Sugar Creek, in the Thunder Mountain District, shattered and recemented quartose sandstone contain deposits of large size and average values of 2 per cent mercury and have produced some fine specimens of high grade ore.

These deposits are quite extensive and with their surface debris covering the mountain slope below, which contain rich pannings in high grade cinnabar mineral, they present a very attractive and probably an extensive resource of mercury ore.

Cinnabar has also been found in connection with igneous dikes at Pine Grove in Elmore County, and at Deer Creek in Blaine County.

Semi-Precious Stones.

Beautiful fire opals have been found in the lava formations of Latah, Lemhi and Owyhee Counties, and garnets of gem quality occur in several of the placer counties of the State.

Corundium and prismatic topaz crystals, including specimens of gem quality, are plentifully found in the placer gravels of Adams, Custer, Boise and Idaho Counties.

IDAHO BY COUNTIES.

ADA COUNTY.

The metal output of Ada County for the past year shows a falling off over the previous year and consists of a few thousand dollars derived from small placer operations on the Boise River and from a limited output of shipping and milling ore produced by the operation of the Gray Eagle Quartz Mine in the Black Hornet District.

This district has some attractive looking quartz veins, containing some excellent values in some instances, but the efforts to develop them on a successful scale has in every instance so far been either misdirected or hampered by a lack of sufficient capital to put the ore resources into proper shape for economical mining.

It is evident from the development that has progressed in this district that some profitable ore deposits will be disclosed if given the necessary capital outlay in their preparation before milling operations are undertaken.

One of the most promising rock enterprises of Ada County is that of the Vernon Stone Quarries, which were taken over during the summer by the Boise Stone Company and are now being equipped with a gravity tramway over a mile long to lay down the stone at a railroad station at the foot of the mountain.

These deposits have gotten into energetic hands, embracing some experienced commercial talent, who, through a systematic advertising campaign are finding a broad market for their product, which consists of one of the finest building materials found in the west, a gray-brown sandstone of uniform texture and of pleasing color tones that works very easily under the chisel and retains sharp edges and promises to develop a very important quarrying

industry for Boise, as desirable building stone is conspicuous by its scarcity in the northwest.

On Dry Creek, in this county, there has been discovered an interesting deposit of almost pure crystalline calcite that would make a very rich lime for commercial purposes. It is at present used in a limited way for chicken grit and is sold as pearl grit for that purpose, and is fully equal to the pure shell by reason of its high lime contents and angular crystal form. It is believed also in combination with some shale beds in the near vicinity that it might make a base for a Portland cement manufactory.

At the head of the same creek there are some deposits of base lead zinc ore. One of these properties has been developed to a depth of 50 feet and shows a body of soft textured igneous rock in granite 10 feet wide, which in cross-section at one point averages 8 per cent lead and 10 per cent zinc, and occurs in crystals that could be easily separated from its light gangue minerals in milling.

ADAMS COUNTY.

Rock Flat Placers—In Adams County the most noteworthy mining transaction of the year was the transfer of the Rock Flat Placers to eastern interests through a deal negotiated by Mr. Frank Johnesse of Boise. This is likely in the very near future to test out the merits of these interesting mineral deposits.

The property embraces several hundred acres of placer ground containing fine prospects at many points, where it has been tested by small pits and sluicing operations, and it is believed when the present plan of development is completed that this property will pay a good margin of profit for the placer gold values it contains, with a probable extra profit from the interesting by-products found associated with gold, whch embraces a variety of rare minerals, including corundum crystals in profusion, with an occasional specimen of gem quality in various shades of color from which oriental sapphires, amethysts, rubies, and other colored corundum gems may be cut.

From the limited amount of work done on the property some elegant specimens of these gem stones have been found, and the property is likely to attain some notoriety as the source of these gem stones as the work progresses.

This property is situated on Little Goose Creek, four miles east of Old Meadows, and has been developed by a cross-cut tunnel starting in the Goose Creek Canyon and running through the granite rim rock of the neighboring plateau several hundred feet.

This tunnel will afford the main ground sluice outlet of the gravel beds on the plateau when connected with a short raise to the surface and will permit of the rapid and economical handling of the gravel by hydraulic methods, for which purpose there is a considerable supply of water

under good head available, and the work now in progress on the property is expected to put it in shape for successful washing operations by early spring.

In addition to the corundrum crystals contained in these deposits there is also associated with them in the clean up boxes monazite, zircon, chromite, illmanite, magnatite, garnet, agate and traces of platinum.

Several of these rare minerals have considerable commercial value and occur in such quantity as to promise a profitable separation by undercurrent and table concentration methods.

In combination with corundrum, these are the common associations of some of the leading diamond deposits of the world, and it will not be at all surprising if the king of all gem stones is found on the extensive operation of this property, for the physical conditions of the ground are not unfavorable to their occurrence; in fact, the bedrock of the property carries a pronounced igneous intrusion of sphereoidal tuff that seems to be related to basalt, although at one point on the property it shows a soft yellow ground on the surface very much resembling the diamond bearing outcrop of the peridotite deposits of Arkansas, all of which combine to give the property a fascinating interest and makes it a worthy venture for the expenditure of the necessary amount of mining capital in its thorough investigation.

Blue Jacket Mine—Adams County carries within its present boundaries the well-known copper bearing district of the Seven Devils, which formerly belonged to Washington County, before the division was made.

The mining industry of the Seven Devils District has continued very quiet throughout the year, with the exception of some prospecting work and leasing operations on the Queen and Blue Jacket mines with a small force of men, from which several carloads of hand-picked copper ore were shipped carrying 31 per cent and about $7.00 or

$8.00 in gold and silver. There is nothing of great importance to chronicle from this section except the anticipation of a deal that has recently been inaugurated by Messrs. Miller and Klienschmidt through an option on the Red Ledge claims on Deep Creek, a few miles north of the Peacock mine. This property is owned by Boise people and the new deal proposes to find the necessary capital for its fuller investigation and development.

The Seven Devils District is noted for the occurrence of very rich copper ores. There has been probably a total of 50 carloads shipped from the Blue Jacket and Queen group that have averaged fully as high in copper as the average given above.

This interesting output has all been made from leasing operations, which have mostly been of a gouging nature, and the metamorphic contact deposits of lime and diorite from which they were derived well warrant a more systematic investigation from the showing made at the shallow depth at which it has so far been mined.

Several other flattering showings of the same character occur in the vicinity of Landore, but none of them have been given sufficient capital to fully determine their possibilities.

Spots and pockets of very high grade copper mineral occur in this district over an area of several miles square.

Red Ledge Mine.—The Red Ledge is a different type of deposit from most of the others that have been operated so far.

It is situated ten miles north of Landore, in the rugged canyon of Deep Creek, a tributary of Snake River, carrying a large flow of water on a steep grade and affording a feasible hydro-electric power site in four miles of its course capable of developing 20,000 horse-power.

Two miles from Snake River, in this profound canyon, and standing out conspicuously from its bluffy south slope, the Red Ledge group of claims covers an immense outcrop of quartz porphyry that is about one mile long

by 2,000 feet wide, which affords a conspicuous feature of the landscape by reason of its brilliant colors, due to the alteration of its iron contents, and presenting an elliptical shaped mass of the dimensions above given that is as red as a freshly painted barn.

This conspicuous color feature is intensified by the fact that the general bordering formations on both slopes of the canyon are dark colored old porphyry of the diorite or diabese family.

A close inspection of this interesting mass of mineral shows it to be uniformly permeated with a fine-grained cupiferous pyrite, in places quite conspicuously stained with green carbonate of copper and the whole mass at the surface carrying appreciable values in gold and silver.

Some small caves at the foot of some of the vertical cliffs are filled with uniform layers of pure sulphur, also copper and iron salts in alternating colors of yellow, white and green and gives an attractive inference of commercial copper values under the surface.

A very limited amount of development has been done on the deposit, which embraces two short tunnels started near the level of the creek and are directed in toward the central core of the deposit.

One of these tunnels is 95 feet long and the other 150 feet long. They are both placed at the least likely point for immediate results, but are directed towards the more silicious central part of the deposit. They pass through a few feet of oxidized country rock showing no value in copper, then come into the wet sulphide copper zone, which, besides the usual dissemination of fine iron pyrites, shows some remarkably interesting secondary changes to chalcopyrite, chalcocite and bornite minerals, from which selected samples can easily be obtained that run 4 per cent or 5 per cent copper, with from 50 cents to $1 per unit in gold and silver. These two tunnels show some more recently intruded narrow dikes and second zones of leaching with very little value, but the bulk of the

ground cut will carry about 15 pounds copper per ton of ore.

Of course the work is just started and is hardly under the grass roots as yet, and the interesting change which is manifested from the iron outcrop to copper sulphide is characteristic of the now famous disseminated copper porphyry formations of other States, which are cutting such a big figure in the red metal market and high mining profits and makes this deposit, in connection with its enormous size, a very attractive venture for the expenditure of a little mining development money.

The present option holders of the property propose to extended the lower tunnel five or six hundred feet, which will undercut the central zone of the deposit at an equal depth vertically under the surface and is likely to determine the position of wide bands or enriched segregations of the high grade copper sulphide minerals described, with the possibility of disclosing one of the big things of the copper world.

This proposition can be proven for a very moderate outlay of capital, and the extension of the Oregon Short Line railroad through the Salmon River Canyon, which is now only seventeen miles distant at Homestead, will put the property within two miles of transportation.

The elevation at this point is low, about 2,000 feet above sea level, where the snow never bothers during the winter season. There is plenty of water available for big operation, and if the deposit is developed sucecssfully its resources can be handled on a very economical scale from a mining and transportation standpoint.

SCENE NEAR ROCK FLAT PLACERS, ADAMS COUNTY

BONNER COUNTY.

Continental Mines—The property of the Idaho-Continental Mining Company in Bonner County, three miles south of the British line, has been the scene of active surface improvements during the year.

This enterprise has been substantially financed and during 1913 should become a prominent produced of high grade lead-silver concentrates and crude ore.

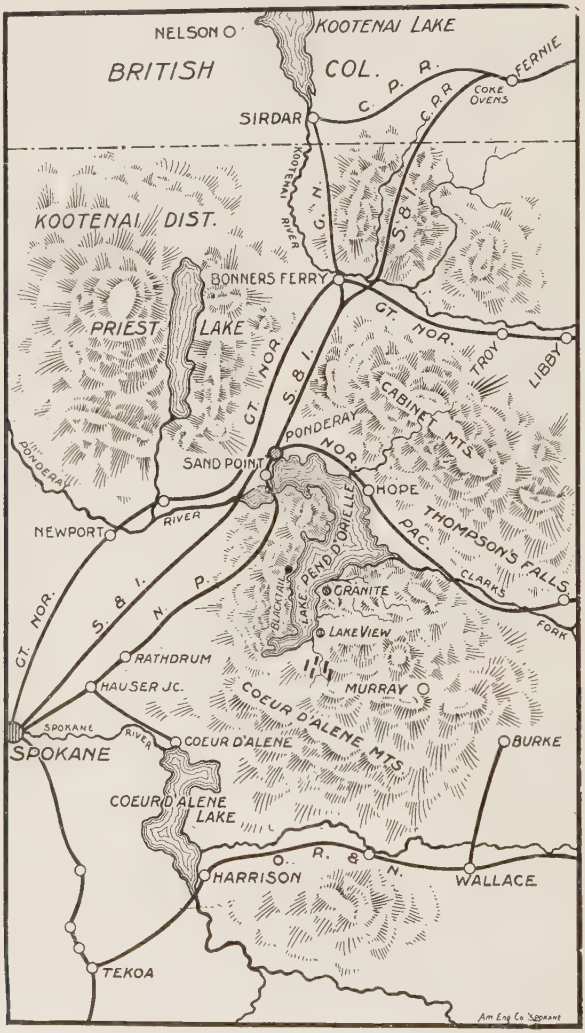
It has an extensive underground development and a measurable resource of mineral, aggregating 175,000 tons, containing an average value of 14 per cent lead, and $5\frac{3}{4}$ ounces of silver per ton, together with probable ore deposits that may be made available by additional development that will easily double the tonnage of this property now in sight.

Very little work has been done in the mine during the year, but the outside work has been extensive, consisting of the construction of a broad guage wagon road from Port Hill, the nearest shipping point, 24 miles distant, which has been built on a 4 per cent maximum grade and may be ultimately transformed into a light railroad.

All the machinery for a hydro-electric power plant of 800 horsepower capacity and a concentrating mill of 300 tons daily capacity has been ordered and considerable of it is already on the ground, and it is anticipated that this complete plant will be in running order by June 1, 1913.

The ore deposit at this mine consist of one of the most persistent lineal manifestations of lead-silver mineral at the surface that has been found in Idaho and carries a close succession of well defined ore shoots for 3,000 feet along the strike of the vein, which is contained in a steeply pitching and intensely sheered quartzite formation. These ore shoots are 4 to 8 feet wide, with a strike north-

east and southwest and a dip of 60 degrees to the northwest and show decided evidence of persistentcy to great depth.



MAP OF PANHANDLE SECTION

This property is only a short distance north of Priest Lake, around the shores of which there are quite a number of prospects, containing lead, copper, gold and silver

values in quartzite, diorite and granite formations, on which considerable prospecting work is being done.

Lawrence Mine—Another flattering Bonner County enterprise is that of the Lawrence Mine at Clark's Fork, on the Northern Pacific Railroad.

This property has recently been equipped with a concentrating mill of 50 tons daily capacity and has a very bright future for a prospective and important source of desirable lead-silver ore.

It embraces a large group of lode claims laid out on the steep slope of Antelope Mountain and only one and a half miles across the flat valley bottom from the Northern Pacific main line depot.

The formation of this mountain consists of argillaceous quartzite, slate and occasional thin beds of fairly pure limestone that strike a little east of north and dip at a rather low angle to the east.

These formations are doubtless of the pre-Cambrian Coeur d'Alene series, but to what particular division of that series I am unable to say without a more extended examination of the neighborhood.

In climbing over the extensive group of claims owned by this company, laid out on a very steep mountain slope and extending through a vertical elevation of fully 1,000 feet above the valley bottom, I was shown a series of seven distinct and seperate veins roughly parallel and only a short distance apart and roughly conformable in both strike and dip with the enclosing formations, the dip varying from 20 to 30 degrees, and they first impress one as being imbedded veins; but a closer examination of the surface and underground works show the ore bodies cutting the bedding in both dip and strike and in numerous instances show their fissured origin in a very distinct manner.

These veins vary in width from 2 to 20 feet and present some of the most attractive surface evidences of underlying ore bodies, judging from the Coeur d'Alene standpoint, that I have ever seen outside of that famous district.

These outcrops consist of alternating ore shoots varying from a brecciated country rock gangue, cemented with iron oxides and lead minerals, to nearly pure black and brown iron carbonate ore for the stretches of 50 to 200 feet in length and are traceable in the direction of their strike for several thousand feet, as is proven by shallow surface work at short intervals.

These shallow surface cuts show commercial ore at almost every opening, usually consisting of a well defined paystreak of a clean galena or lead carbonate ore on one or both walls of the veins, and this mineral is in numerous places well sprinkled through the body of the vein and breccia.

The best surface showing is in an open cut on one of the middle veins of the series, where a swell of iron carbonate ore is exposed 22 feet thick which includes a bed or horse of fairly pure limestone 2 feet thick, 7 feet above the foot wall. The lower portion of the vein under the horse does not show any lead at the surface, but this foot wall streak carries good lead values at other points along the strike. The 14 feet of iron ore above the limestone inclusion is very richly sprinkled with galena and lead carbonate ore and indicates the existence of a very important ore channel when developed at depth.

The ore and gangue of the veins are identical in appearance with some of the best surface manifestations of the Mullan and Wardner Districts, and in such strong persistent fissures I see no reason to doubt they will develop into profitable ore bodies at depth.

The situation of this vein system gives a splendid advantage for cross-cut tunnel development, which is being taken advantage of by the company who have started a main working tunnel near the foot of the mountain, which has now been extended in a distance of 700 feet. It is equipped with an air compressor plant, and at a point 382 feet in from the portal the first and weakest vein of the series has been cut and drifted upon for 300 feet at a

depth of about 300 feet on the dip from the outcrop, and if the ore resources it displays are any criterion of what may be expected from the larger and richer veins that overlie it, the Lawrence is certainly destined to ultimately become one of the conspicuous producers of lead-silver mineral of north Idaho.

The 300 foot drift referred to on this small foot wall vein carries continuous ore throughout its length, pinching down in places to a few inches and swelling to a maximum width of 6 feet of fine concentrating mineral with fat streaks of clean, coarse grained galena in places 6 inches thick.

This drift has produced a dump of concentrating ore estimated to contain 1,000 tons, and judging from some pan tests will probably mill better than 7 per cent lead.

A small stope 40 feet long and 15 feet high has been made on the drift to test out the productive capacity of this vein, and in addition to the fine lot of concentrating ore produced, a small carload of hand-picked mineral was shipped from this work which yielded 71.8 per cent lead and 11.7 ounces to the ton of silver.

This shipment was made to the East Helena smelter and returned a net profit above freight and treatment charges of $1,000.00.

The ore from this vein is quite free from zinc and other objectionable sulphides, and in connection with the surface evidences of this and the other parallel veins the whole system may be anticipated to contain this desirable class of mineral.

The extension of the main crosscut tunnel will intersect back veins of the system at a maximum depth on their dip ranging down to 2,000 feet below the apex exposures.

The new mill, it is anticipated, will furnish the necessary funds to prosecute the further extensive development of the property, and when the other veins have been cut and drifted upon a much larger reduction plant will likely

be required and a very profitable mining and milling enterprise result.

Fall Creek Mines—The mining district around the shores of Lake Pend d'Oreille experienced a rather dull year of development, with the exception of a few interesting points where new work was in progress

Among the most attractive showings made during the past season was that of the Fall Creek Mining Company on the east side of the lake where a big fissured zone bearing some well defined ore courses occur that are rich in iron, zinc, and lead sulphides.

This zone is opened at considerable depth with crosscut tunnels and shows a total width of over 40 feet, in which is included several feet of quartz gangue richly saturated with metallic sulphides and includes one band that is up to 20 inches thick in places of ore sufficiently rich in lead, gold and silver to warrant shipping at a handsome profit.

The deposit is bounded by a nearly vertical smooth wall on one side; this has been followed by a drift for quite a long distance in the anticipation that it would make an ore shoot, but the ore shown in the deposit is nearer the center of the zone and additional drifting and sinking at this central point is likely to disclose a sufficient ore tonnage to warrant the erection of a concentrating mill. The full length of the ore course is not determined, but it gives the appearance of being considerable, and the property presents a good mining development risk, as it is so situated it can be economically opened at considerable further depth by adit tunnels.

This company connected the mine with a lake shore loading platform during the summer by a broad guage wagon road on which was being operated a traction engine at the time of my visit that is intended to convey the shipping ore and quite a reserve of desirable lumber from the vicinity of the mine to the lake front.

Webber Mines.—At Lakeview, the further development

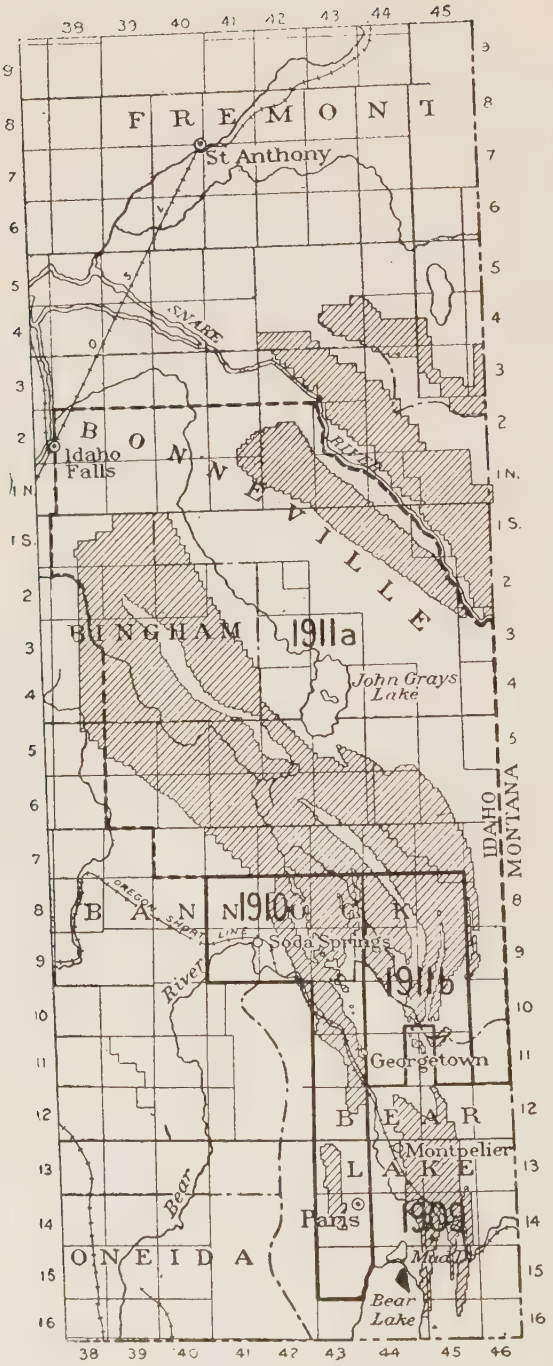
of the Webber Mines was successfully financed during the year, and a long cross-cut tunnel is in progress at this property which will tap it at a depth of 1,000 feet below the cropping.

This is one of the most attractive surface showings in the Pend d'Oreille District, by reason of its large size and strong surface outcrops of quartzone.

Its values run in gold and silver, particularly silver, and it is believed that its ores can be successfully treated by cyanide method to a relatively high extraction, and when the present deep tunnel is completed the enterprise is likely to warrant the erection of a mill of large capacity of this or some other method that the deeper ore horizon may require.

Some leasing operations were in progress in the small high grade grey copper veins of the Black Tail District, and some extensive quarries were being opened on the shores of the lake by Spokane investors for Portland cement rock.

Idaho-Montana Mine—Near Kalka station, on the Great Northern Railroad, 7 miles east of Bonner's Ferry, Idaho-Montana Amalgamated Mining Company have developed an interesting ore deposit through an incline shaft 400 feet which discloses a vein of mineral 2 to 4 feet wide in diorite formation, containing excellent values in lead and silver asosciated with iron sulphide that give present promise of affording some profitable concentrating and shipping ore.



RECENTLY SURVEYED PHOSPHATE AREA—
TAKEN FROM U. S. GEOLOGICAL
SURVEY BULLETIN

BINGHAM AND BONNEVILLE COUNTIES.

These counties are credited with a small yield of good bullion at the United States Assay Office annually, which is derived from limited placer operations of Caribou Mountain District and along the fine gold-bearing gravel bars of Snake River, which traverses the full width of both counties. The accompanying cuts illustrate the simple Snake River burlap machine for saving the fine scale gold of these deposits, which run 3,000 colors to the cent in value. This is the most efficient device ever invented and in competent hands recovers 90 percent of the values.

In the western portion of Bonneville County, the copper-gold ore deposits of the Caribou Mining District have received very little attention from mining operators during the year. This county carries an extensive area of the phosphate-bearing formations and its resources in this respect will some day prove a great asset and source of revenue.

At Willow Creek, a short distance from Idaho Falls, Bonneville County, there is a limited area of cretaceous coal formations, and some interesting prospects of high grade bitumous coal have been found along the northern border of the country that may ultimately afford a convenient source of a very desirable fuel to Idaho Falls.

BOISE COUNTY.

Boston-Idaho Dredges—The most conspicuous mining feature in Boise County during the past year has continued to be that of the Boston-Idaho Gold Dredging Company, on Moores Creek, near Idaho City, whose two splendid electrically driven dredges, with a combined capacity of over 10,000 cubic yards per day, have continued in steady operation throughout the year, including the winter season. They completely eat up and turn over the deep gravel beds of Moores Creek from rim to rim, and are making a record for economy of operation and yardage handled that will compare favorably with the best results obtained anywhere in the placer mining world.

These great machines are working in ground from 20 to 40 feet deep, a good deal of which is the tailings washed down from the adjacent high bar hydraulic operations. While the ground is comparatively low grade, the enormous amount of material handled pays a good profit and aptly illustrates the necessity of large capital risk in mining ventures of this kind. This enterprise has involved the outlay of hundreds of thousands of dollars and will ultimately not only repay the investment but will evidently net very handsome returns before the extensive area of ground owned by the company has been exhausted.

Grimes Creek Placers.—There still remains hundreds of acres of main creek bottom gravel deposits on Grimes Creek and its tributaries in Boise Basin, in the vicinity of Centerville and Placerville, which can be handled with equal facility as the ground now being turned over at Idaho City if equipped in the same modern manner, and this territory has recently been looked over with a view to purchase by the agents of a prominent California dredging company, who are favorably impressed with the

IMPLE BURLAP TABLE MACHINES FOR SAVING THE FINE GOLD OF SNAKE RIVER

BOSTON AND IDAHO COMPANY'S 10,000 CUBIC YARD DREDGE, IDAHO CITY

situation for a big dredging enterprise at this point in the Basin. If a deal results for the transfer of the property, it is very likely to duplicate the equipment of the Boston-Idaho Company.

The extensive high bar gravel deposits and hydraulic operation adjoining the dredge company's territory at Idaho City, and now owned by the Boise Basin Improvement Company, were successfully operated during the piping season of 1912, under the management of E. B. Blaine, and with additional development and improvement added to the plant after the mining operations ceased, this enterprise is now in shape to make an increased output of gold next year, and its extensive virgin resources warrtn the anticipation that this property will continue to make an important annual output of precious bullion indefinitely.

Deep Channel Deposits.—Another great placer resource in the vicinity of Placerville that presents attractive engineering possibilities worthy of serious consideration is the old channel deposits represented by the general claim titles of the Halley Ranch, the Leary and Reed Diggings.

These are ancient river channel deposits that cross the present drainage system of the Basin and presents a period of erosion when the Payette River ran across these present tributary stream courses.

These great deposits of gravel are rather compact in their upper horizons and represent banks of material from 30 to 125 feet deep containing relatively high values per cubic yard, authentically reported from test shafts and hydraulic operations from 20 cents to 50 cents per cubic yard, that it would seem might stand additional handling cost and yet leave a handsome margin of profit for their treatment. Their upper horizons are relatively low grade and rather compact, with layers of shale, which might be removed by big traction steam shovels of the Panama type, leaving the lower horizons in which the bulk of the values of the deposit are contained more susceptible of digging with heavy dredging machinery of the floating

type that could then reach bedrock, where the best pay lies.

These old channel deposits, owing to their immense yardage and their relatively high values per cubic yard, are certainly worthy of the consideration of engineers and investors in this class of mining, as they present the possibilities of a very profitable prize for the successful solution of the method for their treatment.

QUARTZ MINING.

Gold Hill-Iowa Mines—The most promising lode enterprise of the Basin is that of the Gold Hill and Iowa Mine at Quartzburg.

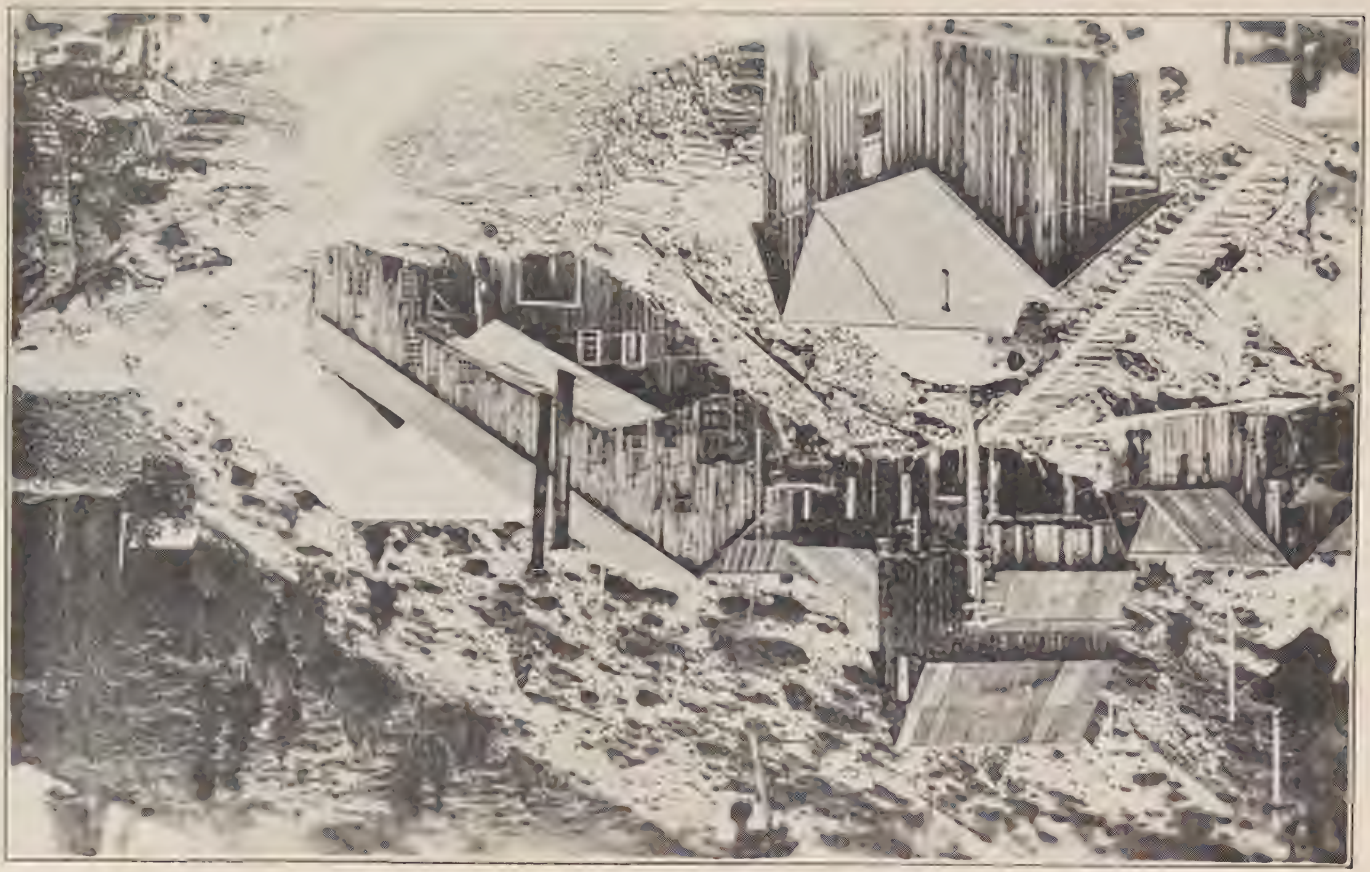
This has been the most productive ore deposit in Boise County and is credited with a total output of precious bullion aggregating three million dollars, while its development only reaches 500 feet below the creek level.

It is operated through a vertical shaft of that depth with several short levels. The property remained idle for several years until taken over by its present owners, who extended development 100 feet below the bottom of the old works, but by reason of lack of capital they have played a gouging game and have only developed one of the former known ore shoots on the property.

Recently, however, it is reported, that the property has passed into stronger financial hands, who are now carrying out a systematic plan of lineal development at the new bottom level of the property and its merits are very likely to be pretty thoroughly investigated within another year.

The deposit consists of a small fissure vein in granite, known as the Gold Hill Vein, which was from a few inches to several feet in thickness, and carried continuous ore said to have yielded an average value of $20.00 per ton in gold during the former operation of the company for several hundred feet in length.

This smaller vein intersects a much larger vein or zone of mineralized porphyry just below the 500 foot level.



This latter ore course carries clean quartz stringers in silicified quartz-porphyry gangue that are rich in free gold and auriferous iron pyrites, forming a mass of milling ore from ten to fifty feet thick with an extreme length of 100 feet.

Several other shoots of a similar shape and not quite so large were worked in the upper levels of the property, and their downward extent may be reasonably anticipated, and when further developed are likely to afford an important tonnage resource of desirable milling ores that may rehabilitate the property to its former importance as a large producer of gold bullion.

Mountain Chief Mine—About three miles west of Quartzburg, the Mountain Chief Mine was under active development during the year by the National Mining and Development Company.

This property has been opened on a well-defined and richly mineralized fissure vein. It is joined on the east by the Belshazzar Mine and on the west by the Ebenezer Mine.

These three properties would work well in combination through a deep tunnel from either side of the hgh mountain divide they traverse, as they are on the same vein and present a remarkablly continuous fissure in granite formation, and would likely afford a number of shoots of profitable ore if opened by a deep tunnel through the combined length of the three properties.

The Mountain Chief claim has several adit tunnels driven on the vein, which disclosed an ore shoot at the time of my visit 150 feet in length, and carrying in thickness from one to three feet of pay ore, and carrying high values in gold.

This is a quartz filled fissure, containing in the ore shoot quite massive iron sulphide ore, associated with a little zinc and lead mineral and some antimony sulphide.

A 20 ton lot of the base sulphide ore taken from this operation during the summer was tested in the Mineral

Hill mill and gave a result of $100.00 per ton in free gold to simple plate amalgamation.

This property was being equipped with a five stamp mill last fall and additional work on the mine, to put the ore body in shape for economical extraction, should afford a profitable gold mining venture as the merit of the deposit is substantially indicated by the present development which in combination with the adjoining Belshazzar and Ebenezer claims and their numerous shallow tunnels and development openings are reputed to have already produced a total output of fully $300,000 in gold bullion since their discovery.

Golden Age Mine.—At Grimes Pass, ten miles east of Quartzburg, the Golden Age Mining Company has done a large amount of shallow development work on an interesting quartz-filled fissure in granite.

This property is equipped with a fifteen-stamp mill and has produced approximately $100,000 from one ore shoot that has been worked from a maximum depth from the highest outcropping point of 265 feet by adit tunnels.

This ore shoot is contained in the same porphyry zone as the Gold Hill and Iowa Mine on its strike to the east.

It is 60 feet long at the surface discovery and is extended at the 265-foot level to 500 feet in length of ore carrying good values and varying in width from one to ten feet. The average yield of the ore has been about $14 per ton in gold.

The lower development tunnel on this property is 1,400 feet long and is only at a slight elevation above the bed of Grimes Creek, near Grimes Pass. The company is considering the extension of a 3,000-foot tunnel from the steep slope of the Payette Mountains near by which will give, when complete, an additional depth of 1,000 feet on the ore body. The expansion in length of this interesting ore shoot would indicate a primary ore deposit that has suffered very little from natural erosion, and presents a flattering prospect for an extensive resource of profitable

GOLDEN AGE MINE, NEAR GRIMES PASS

ore at further depth which would be made economically available by the projection of the long tunnel, and would probably result in a dividend paying property.

The ore of the Golden Age Mine, like that of the other mines in this locality, carries a high percentage of metallic sulphides, particularly of iron pyrites and associated lead, zinc and antimonial minerals.

The occurrence of the latter minerals, especially the antimony, is usually a sure sign of increasing gold values, and some very rich specimen rock has occasionally been found associated with this latter mineral in this property.

The locality around Grimes Pass also contains some large deposits of the base ores mentioned, associated with copper sulphides and fair silver and gold values, and seem worthy of more extensive development, as these ores are contained in a light gangue, and are distinctly crystalline and would be easily separated into their respective classes by concentrating machinery.

PEARL MINING DISTRICT.

The mining business in the Pearl Mining District, 20 miles north of Boise, has experienced a rather dull year.

The reopening of the well-known Lincoln mine of that district was undertaken and made considerable progress, but was interrupted by litigation and has remained idle for several months.

The only ore production from that district was from leasing operations on the Whitman property, where quite an output of good ore was produced by J. M. Lilligren and associates.

Granite State Mine.—The Granite State Mining Company of this district carried a small force of men throughout the year, and continued their development. They now have quite an extensive resource of milling ore blocked out, containing excellent values in gold, but this ore, like all other ores of the district, is of a refractory nature and difficult to treat by any method except smelting, which

involves a treatment and transportation charge which is prohibitive.

This company has patiently watched the efforts of other operators in this field in their attempts to solve the metallurgical problem which the ore involves to warrant sucessful treatment and profitable extraction of their values on the ground. Some marked progress has been made in this respect, and when the Granite State people decide the best solution of the problem has been reached, they will probably equip their property with a decent size milling plant.

This enterprise is handled in a very capable and conservative manner, and while its stockholders no doubt are chafing at the tardiness of profitable results, the course of the management has been well justified under the circumstances.

Blood Placers—At Gold Fork Creek, a tributary stream entering Long Valley in Boise County, the Blood placers have been the subjetc of considerable litigation troubles and interference from ranch land claimants.

This property embraces some high bar diggings which are said to have yielded some profitable results in early days by simple hydraulic operations.

The group also covers an extensive stretch of flat creek bottom that has been subject to considerable testing work by competent placer miners, who have found some excellent values and it is believed that the property carries quite an extensive area of desirable dredging ground, and the negotiations now in progress are likely to result in the equipment of this property with a plant of this kind.

HORSESHOE BEND COAL DEPOSITS.

Lignite Mine.—A deal was recently made transferring the Hi Henry coal deposits at Horseshoe Bend, Boise County, to the control of some Minneapolis capitalists who are represented on the ground by Mr. Parker. This

gentleman is employing a small force of practical coal miners and is undertaking a more thorough development of these deposits with a view of determining their value as a fuel source.

This is a lignite coal in the tertiary shales and the sandstone of the Payette Lake period, and occurs in rather disturbed veins in places several feet thick, and it is hoped by the present management that they will be able to disclose a tonnage resource that will supply an urgent local demand for domestic fuel, whose distribution will be greatly facilitated by the recent construction of the new Idaho Northern Railroad past this point to Long Valley. This new short line railroad extension is a very important new transportation feature for Boise County, as it makes available the great agricultural and timber resources of the Long Valley country and will encourage the development of the vast mineral region that lies to the north and east of it, which should ultimately afford a magnificent market for the farming products of this section.

BANNOCK COUNTY.

The metal mining business of Bannock County, in the vicinity of Pocatello, has dwindled through lack of capital or intrinsic worth, or both.

Fort Hall Mine.—This section had some very interesting surface prospects on which a good deal of scattering development work has been performed. Among these, the likeliest chance for a successful outcome were the big low grade ore deposits of the Fort Hall Company, containing copper-iron sulphide ores, but so far their sucecssful mining and treatment has not resulted very profitably.

Phosphate Deposits.—The eastern portion of Bannock County embraces a very important area of the most desirable phosphate deposits of the southeastern field, and they are very conveniently located to railroad transportation and should ultimately afford a source of mining and manufacturing profits of great magnitude.

Hot Springs.—This county carries some remarkably interesting mineral springs along the Portneuf River, among which Lava Hot Springs are owned by the State and should some day become a famous health resort, by reason of the medicinal virtues their waters are demonstrated to contain.

Attempts have been made to lease the property from the State with the object of establishing a sanitarium at this point, which is geographically well situated for such a purpose, and together with the fact of the natural beauty of its situation and that it is on the main division of the Oregon Short Line and easily accessible, make this an ideal point for a health resort, but a clause in the title to the State from the Government to this property involves the maintenance of free bath pool which is a feature which has mitigated against the undertaking by private capital.

RUGGED MOUNTAIN TYPOGRAPHY ABOVE WILBERT MINE

BLAINE COUNTY.

Wilbert Mine—The most productive mine in Blaine County during 1912 was that of the Wilbert Mining Company in the Dome Mining District in the Little Lost River Mountains.

This property has been operated with a new concentrating mill of 100 tons daily capacity, which was completed and gotten into commission last spring. Through faulty design or a misconception of the nature of the ore to be handled, the operation of this mill has not been very satisfactory, although a good many carloads of rich lead concentrates have been shipped from the property during the year, but a serious loss was made in the tailings, due to the extremely fine grained dissemination of the mineral, which consists of a quartzite gangue and a lead sulphide and carbonate mixture in which crystal forms have been largely destroyed by crushing movements of the deposit since it was formed.

Several important adjustments and improvements were made in the plant, which is now believed to be in such shape as to make a much higher recovery of the values than at first possible.

The property is located 40 miles from the nearest shipping point at Arco, on the Salmon River branch of the Oregon Short Line railroad, to which point the high grade lead concentrates and crude ores are hauled by wagon and auto truck.

The latter method it was believed would prove much more economical than horse flesh, but so far has not proven as satisfactory as anticipated by reason of the road in places being saturated with irrigation water and difficult for travel on that account.

Development on the Wilbert mine has continued with a

good force throughout the year, a special feature of which has been the opening up of the great surface showing by quarries and the extension of the main drift from the lower tunnel on the property to the north, which is continued in ore for several hundred feet from the point of interception on the vein and to a considerable distance beyond the surface outcrops, showing a gratifying lineal extent of the ore deposits that is an agreeable surprise to the owners and fully insure the former estimate of tonnage that the property contains above this level.

Some concern was felt about the probable downward extent of this ore body by reason of the marked change in the formation which it was penetrating. It occurs in a zone of light colored vitrious Cambrian quartzite that is sharply folded. Just below the lower tunnel level, the light quartzite is succeeded by heavy beds of dark maroon colored rock, and some high geological authorities, who visited the property during the year, contend that the favorable ore bearing formation folds under the dark colored rock and that the ore will continue in the present matrix to an indefinite depth.

Recent reports from the development of this property indicate that the main surface showings of ore which are situated nearly 1000 feet apart may connect continuously in the underground development and with the favorable prospect of continued strength at further depth, these conditions greatly enhance the further value of the property as a source of high grade lead concentrating ore, with the prospect that it will continue an important producer for a long period and may ultimately warrant much larger milling facilities.

Wood River Mines—The Wood River section of Blaine County experienced another dull year in the matter of ore production and development.

Renewed interest was shown, however, and work of development at several points are likely to produce results in new ore reserves at no distant day.

The Wood River Mineral District and its tributary districts are very extensive in area and show a remarkably wide distribution of ore of various kinds and characters. Its gangue minerals and formations are in some respects, bearing on its ore genesis, similar to some of those of the Coeur d'Alene in the fact that the lead-silver ores occur in ancient sedimentary formation and that their gangue minerals are decidedly mixed with siderite, iron carbonate, and they have been folded and ruptured by intrusions of quartz, monzanite, diorite and eruptive granite masses and dikes, the class of igneous rock that is believed to underlie the Coeur d'Alene series and shows in conspicuous irregularly shaped masses near some of the most productive fissures of the northern district.

The smelting ores, however, of the Wood River District, while much richer than those of the Coeur d'Alene, occur in a more slaty and shaly formation that is less susceptible of open fissuring and shattering and the formation of extensive ore bodies, which in the Wood River sediments occur in a more lenzy form and are less certain in extent.

The district has made a very important yield in the aggregate of silver-lead values, amounting to nearly twenty million of dollars since it was discovered, and the high grade ores usually run one to two ounces of silver with each unit of lead. They at no place have been followed to any great depth. The formations are decidedly faulted, which is one of the characteristics of all the important ore producing districts in the world, and it is by no means a settled fact that the more prominent ore bodies of the district have been exhausted, as there is decided evidence that they have simply been lost by faulted displacements, and in all probability will be again recovered with further development at depth if given the proper capital encouragement.

At Bullion, the Bullion, Jay Gould and Mayflower veins show an outcrop that has been stoped almost continuously at the surface for nearly three-quarters of a mile in length.

This famous ore channel, while not wide at any point, was noted for the high grade silver lead ore it produced with a total gross output of five million dollars above the drainage level of the gulch in which it occurs and at only a few hundred feet in depth below the apex of the vein, and it seems unlikely that such a continuous outcrop of mineral, and the strong fissure conditions accompanying it, would be exhausted at such a shallow depth.

As a matter of fact, these mines encountered in their lowest levels excessively faulted conditions at the time when silver was demonitized, which discouraged capital in a further effort to unravel the complicated faulting system encountered.

This fault system has been quite extensively studied in the adjacent Red Elephant Mine, which has been operated for a number of years by the Quincy Jr. Company.

A new company, called the Red Elephant Consolidated Company, is now driving a long tunnel from the southwest side of the Bullion Mountain in the direction of the Bullion ore bodies, which is likely to result, when completed, in the solution of this interesting problem, and it may ultimately lead to the rehabilitation of the Bullion deposits in their former glory of high grade ore production.

Another important example of the temporary loss of the most valuable ore deposits in this district by faulting and folding is that of the Minnie Moore Mine at Bellevue, which was formerly owned by an English company and made a rich output of lead-silver mineral aggregating seven million dollars in gross value, when the ore body was lost at 900-foot level, and some extensive development at the 1,000-foot level failed to recover it, at which point the operation was abandoned and remained full of water for several years. It was subsequently purchased and reopened through the advice of Mr. R. T. Tustin, and under the management of Mr. Irwin E. Rockwell and associates, with the aid of some old-time practical

miners, who had been employed in the former operations of this mine, and with the advice of expert geological talent, it was discovered that the Minnie Moore vein had made a horizontal fold at the 900-foot level and that the 1,000-foot level was entirely under it and in the foot-wall formation.

A little cross-cutting and raising from the 1,000-foot level disclosed these conditions and opened up the downward continuation of the ore body on its normal dip beyond the fold, from this new work, ore to the value of $1,500,000 has since been extracted of the same high grade character for which the mine was formerly noted, when the famous ore channel was again cut off by a north-south vertical fault, below the 1,000-foot level, and since that time it has not been recovered, in spite of the expenditure of considerable development capital in an effort to find it.

The problem, however, has been pretty well threshed out by Mr. Rockwell and all the movement theories reduced to a narrow limit, and it is believed by the present operators of the property that they are in close touch with the solution of the earth movement puzzles that robbed them of their ore body and they think they will recover it in the near future from the development plans now under consideration.

The extensive work which has been performed in the pursuit of this famous ore channel has discovered other ore resources in the property including a large vein in the foot-wall, rich in zinc, which, while of a complicated nature, it is believed contains a large tonnage of mineral that can be profitably separated for the zinc contents, by modern flotation methods.

The Queen Extension Mine, situated across the gulch from the Minnie Moore Mine, has been undergoing development during the year with a small force of men through the old Queen tunnel that penetrates the vein just above the main valley slope at Broadford.

This vein was one of the noted producers in early days on the Queen property and is credited with an output of a million dollars worth of high grade lead-silver ore from a single shoot which had a buried apex, a fact which lends strength to the theory of the permanency of the ores of this district to very considerable depth.

This handsome ore showing became quite zincy in the bottom level about 200 feet below the valley, and while still showing an important reserve of that class of ore, it has remained idle and unattractive for years, owing to the limited market for zinc mineral until recently.

The present demand for this class of ore, however, makes this old ore shoot a commercial possibility for additional resources of profitable ore with further extensive development at depth.

The Queen Extension Mine follows the same vein to the northwest, which is very well defined. Besides putting this old adit tunnel in shape, this company has extended the tunnel 887 feet and it now has a total length of 2,282 feet and a face depth of 500 feet.

This work has passed through one shoot of concentrating ore of very fair grade, and a raise is being put up to connect with some old workings on the vein near the surface. Recently a second shoot of concentrating ore of better grade has been encountered in driving the main tunnel that carries some bunches of first-class ore and gives encouraging evidence of developing into an important tonnage resource and possibly of containing a paystreak of crude shipping mineral.

The galena found in this work is high grade in silver, running up to over 100 ounces, with 60 to 70 per cent lead, which is decidedly characteristic of the old Queen ore body, and the enterprise has a very flattering chance for success in its present condition if the work is continued.

The other development enterprises in progress on Wood River this year were at the Golden Glow group, and the

Starlight group, both of which employed small crews of men throughout the year.

The latter property is situated a few miles east of Ketchum and has been undergoing development for the purpose of trying to discover the deeper continuation of the rich lead-silver ore bodies of the Elkhorn mine, which produced some of the richest smelting ores in the Wood River District in the early days and made a large output, exceeding a million dollars in value, but its ore bodies were terminated suddenly at a comparatively shallow depth by horizontal faulting.

This enterprise is being run by the Pulaski Mining Company and is in charge of one of the early day operators of the Wood River District, Mr. H. J. Hardess, who has had wide experience in handling several of its most important ore resource for the Philadelphia Company, including one on Little Smoky Creek known as the Silver Star that has 60,000 tons of developed ore containing paying values in gold, silver, lead and zinc.

In his work at the Elkhorn group the results are unsatisfactory from the standpoint of the original idea of finding a continuation of the rich lead-silver ore bodies at further depth, but a careful study of the situation, however, has resulted in some interesting developments, and at considerable distance northwest of the old ore channel a wide zone of metamorphic mineral, in close association of igneous intrusion and consisting largely of garnet rock, is being opened up by adit tunnel several hundred feet lower in depth than the old mine, which is found to contain very little lead but very fair values in gold, from which several carload shipments of selected ore have been made that have sampled around $30.00 per ton and quite an accumulation of mill dirt has been made of about half that value.

While it will take considerable further development to demonstrate that this property will make a paying gold mine the prospects are nevertheless very encouraging to

that end, and rather lend the impression from the position of the deposit that it might have been the original vent of the Elkhorn lead-silver minerals, and that the overlying unaltered sediments in which they occur have been shifted to their present position by horizontal faulting.

At Boulder Creek, above Ketchum, the Golden Glow Mining Company have been pushing development on an interesting group of claims carrying some shoots of rich smelting mineral.

One of these shoots is 140 feet long and one to eight feet wide, containing values from 30 to 70 per cent lead in the form of galena, with occasional splotches of gray copper ore.

Four carloads of crude hand-picked mineral shipped from this property in 1911 had an average sampling value of $100.00 per ton, of which $12.00 was in gold.

There is a total of 2,000 feet of tunnel work on the group, and a raise is now being made to intercept the main ore shoot at considerable depth below which it was worked in the upper tunnel, and some profitable shipments may be expected from this group another year.

The Boulder Creek Mines incorporation in the same vicinity encountered a nice streak of high grade zinc ore in their long development tunnel during the year and additional drifting and cross-cutting are likely to disclose some profitable ore bodies, as the present ore discoveries give evidence of the permanency of the mineral in the vein to considerable depth.

The Homestake Mine, 12 miles above Ketchum on Lake Creek was also undergoing development during the year with a small force.

This property carries a well defined sheer zone of 40 feet wide, whose shallow surface developments have produced ore to the gross value of $80,000, according to tradition. It is mineralized for hundreds of feet along the outcrop of the vein and has recently been cut at a depth

of 300 feet, at which point some excellent ore has been encountered and when driven upon and further crosscut gives eminent promise of developing an ore course of very considerable tonnage capacity.

East Fork Mines—On the East Fork of Wood River, five miles from Gimlet, the North Star and Triumph Mines, each embracing a large group of patented claims, would, if consolidated, present a remarkably attractive mining tunnel development enterprise with a prospect of undercutting a million ton resource of 15 to 20 dollar ore.

These two mines contain the largest bodies of mineral ever developed in the Wood River District and have remained idle on account of the extremely refractory character of the ore, consisting, as it does, in the Star Mine of an amorphous mass of arsenical pyrite, carrying 6 to 8 per cent lead and 6 to 8 ounces per ton in silver, together with 10 to 15 per cent zinc and a little gold. Several attempts have been made to separate the useful minerals from the associated worthless sulphides but very little success has been met with in this connection.

On the main tunnel in the North Star Mine, which is 1,500 feet in length, there is now disclosed a body of mineral 200 feet long and over 10 feet thick of the character above described, and in addition the face of the tunnel has been extended into the second body of similar great size whose lineal extent is yet to be proven.

This ore occurrence is at a depth of over 600 feet in the dip of the vein, and if it could be figured on as a consistent channel through to the surface it would contain over half a million tons of ore of itself.

The Triumph Mine in the near vicinity is developed through a vertical shaft now full of water and has several extensive levels disclosing a body of massive iron sulphide ore carrying 8 to 10 per cent lead and an ounce of silver to each unit of lead with very little zinc. This ore resource is from 5 to 8 feet thick and proven to be several hndred feet in length.

A cross-cut tunnel driven from the East Fork valley would tap this vein system (including several other veins besides the ones mentioned that are credited with a total output of something like a million dollars of cleaner high grade ore) at a depth varying from 100 to 1,000 feet in a drive of 2,000 feet from the portal, and with extensive drifting would doubtless disclose a great tonnage resource of these base ores with important additional reserves of the associated clean high grade minerals for which these veins have been noted in the past.

It is more than probable that with some of the present flotation processes now beng successfully used in the separation of refractory sulphides mixtures that these baser minerals can be successfully treated, and the enterprise herewith suggested is well worthy the serious consideration of big mining capital as it promises a tonnage resource of total gross value equal to the entire output of the Wood River District to date.

If continued 2,000 feet further than outlined, this East Fork tunnel project would intersect the Independence veins and other parallel veins in that richly mineralized part of this section of Wood River at great depth.

The Independence has been developed over 300 feet deep with adit tunnels and now shows quite a reserve of high grade ore.

It is equipped with a good mill, but its successful operation has been embarrassed by apex litigation for several years past.

All the smelting ores that have been mined from the Wood River District to date have carried good values in gold, often amounting to as much as $10.00 a ton and the granite formations of the district contain some magnificent examples of gold bearing quartz filled fissures of excellent promise.

Hailey Gold Belt—At Doniphan, 14 miles west of Hailey on the Hailey Gold Belt, there is presented a splendid opportunity for a big gold mining development enterprise.

At this point the lava flows have been eroded over quite an extensive area and there is now exposed a weather granite surface of low foot wall country that is traversed from north to south for over two miles by a continuous outcropping quartz vein from five to 40 feet in thickness, consisting of richly colored more or less honeycombed quartz that makes quite an attractive surface showing from a gold quartz prospector's standpoint.

From the Camas No. 2 property this fissure has been developed by an incline shaft to a depth of 500 feet with five or six levels and is reputed to have produced over $500,000 in gold bullion.

The property was formerly equipped with a large stamp mill, which was destroyed by fire, and the enterprise has been lying idle for a number of years.

People who are familiar with the former operation say it was run in a very extravagant and careless manner, and if it had been in careful and conservative hands would have been in successful operation to the present time. The combination of this and adjacent properties on the same vein is well worthy of substantial investigation and development as it presents the possibility of a very large resource of fair grade gold ore, that with the present advantage of cheap electrical power, and its more recent railroad convenience by the construction of the Camas Prairie branch, it presents the possibility of a big gold mining and milling enterprise that might be made to pay a handsome margin of profit and last indefinitely.

There are a number of other interesting gold ore deposits in the granite formation of this vicinity containing excellent values and well worthy of the attention of investors in this class of mining.

At the west end of Blaine County there are some quite extensive tracts of placer gravel on the South Boise River and on Little Smoky Creek, which have been demonstrated by preliminary prospecting work and practical hydraulicing operations on a small scale to contain rela-

tively high values in placer gold that is coarse in grain and easily saved.

The old Reeves Diggings on Smoky Creek now owned by the Little Smoky Mining Company, Limitd, have been the subject of considerable prospecting work during the past year and it is believed by the owners they contain quite an extensive yardage of gravel that will average 30 to 40 cents per cubic yard, and is so conditioned as to be specially adapted for a small dredging operation in the main creek that ought to pay a handsome profit for its installation if the right kind of a plant is installed and intelligently handled.

At the Jones Diggings on the South Boise River near the Elmore County line, an old channel bar has been opened to pay gravel during the past season that should commence to produce another year.

This is an immense bank of gold bearing material that will warrant a big hydraulic operation and is conservatively estimated to contain from 10 to 15 cents per cubic yard to a depth of nearly 100 feet.

The main channel of the South Fork above Bear Creek, almost to its source, is covered with placer claims upon which a little preliminary testing work has been done and remarkably fine values found in coarse gold. This is another point that promises a steady and important source of precious bullion when it is properly equipped with the necessary machinery. This ground is believed to be heavy for dredging but could be successfully handled with a bedrock flume hydraulic and elevator equipment, for which method of treatment there is an ample supply of water on the ground and easily available for a big operation.

At Bear Creek the El Oro mine was operated for a short period during the past season. A mill run of 30 days was made on the ore from this property that gave milling results of $21.98 per ton of ore treated.

The El Oro contains a well defined fissure vein in granite two to ten feet wide that has been opened by cross-cut

tunnels to a depth of 200 feet below the croppings and has been drifted upon for over 300 feet.

This ore yields about 50 per cent of its value to plate amalgamation, and the concentrates, containing a little lead and zinc with an excess of iron sulphide, average over $100.00 per ton in gold.

The property is equipped with a new ten stamp mill, with 1,250 pound stamps, amalgamation plates and two Johnson vanner concentrating tables.

This plant is of first-class construction and is run by electric power developed on the ground by a small tributary of Bear Creek from a high head.

The power plant is not sufficient, however, for the operation of the mill except during the high water period, but this trouble can be obviated and improved by additional expenditure in this connection.

The district in which this property is situated has a number of other flattering gold ore prospects and it has recently been made much more accessible by the new railroad construction to Camas Prairie and should attract more attention from prospectors and investors in the future.

Smoky District—The new railroad to Camas Prairie also brings in closer touch with markets several other gold ore deposits of merit, and the numerous splendid showings of the Little Smoky District, where there occurs some handsome bodies of lead-silver mineral rich in zinc and carrying relatively high values in gold, and with the former wagon transportation charges cut in two by the nearer approach of a railroad shipping point, their rich milling values should now be made to pay a handsome profit under capable management and they are especially worthy of the attention of mining investors.

A new strike of rich lead-silver ore in a body of 3 feet wide has recently been made on Lookout Mountain, about 2 miles south of Bellevue, that carries rich shipping ore and high concentrating values.

Its lineal extent has not been proven but the present showings are decidedly attractive and interesting from the fact the discovery was made from some old workings, which had been driven paralel to the ore body by former operators, and it further demonstrates that the virgin ore deposits of Wood River have by no means been all discovered.

VIENNA DISTRICT.

Another interesting point of ore development was made in the old Vienna Mine near the head of Salmon River in the north corner of Blaine County during the past year.

This property embraces a very extensive group of patented claims on which a very large amount of development was done in early days that yielded an output of over a million dollars in gold and silver.

One of the old tunnels has been reopened and retimbered and discloses a wide fissured and sheared mineral zone in granite containing rich streaks of lead-silver and gold bearing mineral in quartz, from which three carloads of hand sorted ore were shipped during the year containing an average value of $50.00 per ton.

The ore bodies on this property are associated with porphyry intrusions and are of great size and lineal extent and contain some excellent values, varying from $5.00 to $50.00 per ton, and in widths of from 5 to 10 feet and over.

This property was worked at a time when the supplies had to be freighted by wagon from Corrinne, Utah, a distance of over 300 miles and only the choicest milling ores were extracted, leaving the base lead ore which contains some antimony.

It is believed from the size of the dumps of low grade ore now in evidence at the several extensive tunnels on the property that the former operators avoided the smelting mineral as much as possible, as their method of treatment was by stamp milling and pan amalgation for the recovery of the gold and silver values, and that there remains in the

property an extensive tonnage resource which, by first concentrating the smelting mineral out, could then be treated by modern chemical methods for the recovery of the gold and silver values and form the basis of a very large mining and milling operation.

The principal new metallurgical progress of the Wood River District during last year has been the construction of a 125 ton mill with roaster and magnetic separators at the Red Elephant Mine by the Danaher Mining & Milling Company, which is designed to work an extensive dump of mill tailings from the Red Elephant Mine.

Careful preliminary experiments were made in the treatment of these tailings and the management anticipates being able to make a profitable extraction and separation of their contained lead-silver and zinc values.

Plans are in progress for the installation of a Macquisten tube zinc separator for the old Queen tailings dump and other resources at Bellevue. This is now a well proven process, whose success at this point is likely to prove an entering wedge of additional installations of this kind in this district, which carries a wide distribution of zinc bearing minerals in bodies of very considerable size at different points.

BEAR LAKE COUNTY.

Waterloo Mine—Bear Lake County continues to be the only county in Idaho from which a production of rock phosphate mineral is made, which is derived from the operation of the Waterloo Mine near Montpelier, whose output during the year has amounted to several thousand tons.

The accompanying flashlight pictures give a lucid idea of the mode of occurrence of this mineral in bedded veins like coal and an idea of the method of mining it like coal.

This county is one of the richest in the State in the way of phosphate mineral resources and will ultimately develop a flourishing mining industry based upon this interesting mineral.

The expansion of this industry at this point has been seriously retarded by continued title litigation, but Bear Lake County contains nearly allthe privately owned deposits of this class that are not withdrawn from public entry by the Government, and when the litigation troubles and title matters are settled, this county should forge ahead in this industry, as it is a recognized fact that the production of the grain, especially wheat, the chief food supply of this country, is not increasing in half the ratio of the population and demand, while the wheat growing land areas are becoming rapidly circumscribed, and as wheat is a ravenous consumer of phosphate elements of the soil it is only a question of a few years when, to maintain the necessary production of this cereal, this great fertilizing resource will have to be drawn upon very extensively.

These phosphate beds occur in all respects like pitching coal veins and are mined with the same kind of tools, and the mineral is produced at about the same cost per ton.

These Bear Lake County deposits are particularly clean

and free from waste; they part readily from the walls and consequently require hardly any sorting.

The average grade of the crude rock mined and shipped is a little better than 70 per cent calcium phosphate, and like all the other Idaho deposits of the same class, which have been extensively tested by the United States Geological Survey, are remarkably free from the objectionable elements of iron and aluminum, which greatly deteriorates the value of some of the southeastern phosphate deposits of the United States, in Florida and Tennessee.

The total contents of these objectionable elements in hundreds of samples tested by the Government runs less than three-quarters of one per cent, a fact that will prove of great advantage in the marketing of this mineral when its virtues have become more fully advertised and known.

To assist in the introduction and utilization of this extensive mineral resource, the State should make some experiments with the raw phosphate rock at its agricultural experiment stations for the purpose of demonstrating the great virtue of this mineral in increasing grain yields and as an incentive to the extended use of this mineral.

The Idaho deposits of bone phosphate are of enormous extent and have been demonstrated by the Government survey to contain several billions of tons. They occur in a series of thin bedded fossiliferous lime and shale formations that have been classified as the Park City series, by reason of the fact they were first identified in connection with investigations and reports on the ore deposits in Park City, Utah.

These Park City formations are of middle carboniferous age and are of very extensive areal distribution in Idaho, reaching from the Utah line on the south to the Montana border on the north, through the southeastern tier of counties, extending as far west as the Lost River Mountains in Custer and Blaine Counties.

In addition to its splendid phosphate resources the Montpelier District has some interesting copper ore de-

posits, which have been undergoing development through the year at the Bonanza mine.

The ores of this property are low grade but the developments carry an immense flow of water, from which it is believed by the operators that the profitable precipitation of copper might be made.

Considerable capital has been spent on this property in an effort to demonstrate a resource of mineral that can be handled at a profit.

CASSIA COUNTY.

The principal feature of mining development interest in Cassia County is that of the Cumora Melcher vein, which is being developed through a deep cross-cut tunnel under the management of Mr. Rammelmeyer.

These properties contain a series of well marked quartz filled fissures that carry some shoots of high grade lead ore carrying excellent values in gold and silver, and quite a lot of preliminary work is being done that exposes some flattering showings of shipping and concentrating ore.

This enterprise is in good hands and is backed by experienced capitalists, and when the present plan of deep work is carried out it is likely to afford an important source of profitable ore and put Cassia County in the shipping list.

CUSTER COUNTY.

Clayton Mines—One of the most important mining transactions in Custer County during the year was the acquisition of the extensive interests of the Clayton Mining & Smelting Company, adjacent to Clayton on the Salmon River, 60 miles northwest of the Oregon Short Line terminal at Mackay.

This property was taken over by the Idaho Mining & Smelting Company and the deal was promoted by Mr. R. T. Tustin, who is now the general manager in charge at the properties. Mr. Tustin formerly operated on Wood River and was responsible for the successful revival of the Minnie Moore enterprise after it was abandoned by its English company and had been idle for years.

This new Custer County company embraces the former extensive holdings of the Clayton Mining and Smelting Company, including a 100-ton smelter at Clayton, the Ella group at Clayton, the Red Bird group at Squaw Creek, the Silver Rule group at Slate Creek and the Skylark group at Bayhorse.

This property was extensively operated in the '80s when silver was worth $1.00 an ounce, and a short period after its decline to its present bullion values, and made a total output approximating $7,000,000; but owing to the fact that silver was the chief value produced the company was unable to stand the cost of the expensive wagon haul when the white metal declined so seriously, and their development has been neglected for a number of years, with the exception of the Red Bird Mine at Squaw Creek, upon which a few men have been employed a good deal of the time, resulting in the blocking out of a large reserve of new ore.

This mine has produced a million dollars above its 400-

100-TON SMELTER, IDAHO MINING AND SMELTING COMPANY, CLAYTON, CUSTER COUNTY

CARLOAD LEAD-SILVER BULLION, IDAHO SMELTING & MINING COMPANY

foot level, and it has since been tapped 400 feet deeper, and in addition several intermediate levels have been made. The property is said to now contain a bigger reserve of ore than it has shown at any period of its history.

The Red Bird is a very interesting mineral deposit, characterized by pipe shaped shoots of lead carbonate and galena ore carrying excellent silver values, which is interspaced vertically with clean iron ore bodies, affording an excellent fluxing mixture for the 100 ton smelter with which the mineral is locally reduced to bullion at Clayton, a few miles from the mine.

These ore shoots vary from a cylindrical pipe a few feet in diameter up to ragged shaped channels as much as fifty feet across. They carry a high excess in iron and afford a very desirable smelting material. They follow a nearly vertical zone of silicious blue limestone beds in close contact with other silicious sediments and are unquestionably due to ascending hot mineral solutions. In fact, there is definite evidence on the main Salmon River, which cuts the main ore bearing formation at a low point, that the Sullivan Hot Springs are a dying phase of the origin of these ore bodies, as these hot springs arise out of a similar shaped pipe of iron ore containing some lead ore values, and the residue minerals they now precipitate embrace several of the gangue minerals now found in the adjacent ore bodies, giving a very interesting illustration of ore genesis of this district.

Recent reports from the property indicate that the Red Bird is capable of maintaining the present operation of the smelter for some time to come, independent of the other properties of the company, each of which warrant the anticipation of additional ore resources with further development.

The smelter on this property at Clayton was blown in last October and since has made a splendid production of silver bearing lead bullion that is hauled by wagon freight to the railroad at Mackay and shipped from there

to the refineries, the team hauling coke in as back freight.

Ramshorn Mine.—Negotiations are said to be in progress for the addition of the Ramshorn Mine at Bayhorse to the string of properties now controlled by this new company.

The Ramshorn Mine is probably the best developed resource of dry silver ore in Idaho, its estimated resource now in sight being figured all the way from a million ounces of silver to two million dollars of gross ore value.

This property carries a remarkably well defined fissure vein in black slate formation that is probably an altered form of igneous rock. It varies from a few inches to several feet in width with a gangue of quartz and massive spathetic iron, and in the main ore shoots the spathetic iron is well sprinkled with grey copper ore that in some of the stopes disclose streaks of clean copper mineral as much as a foot thick that will sample 1,000 ounces silver per ton and 25 per cent copper.

The average run of the ore, however, is figured about 50 ounces. It carries a high excess in iron carbonate that makes a desirable mixture for lead smelting, as the iron elements help to flux the charge and the high silver values enrich the lead bullion product.

There are a number of interesting lead ore deposits at Bayhorse in a massive limestone series that were gouged of their easily available high grade ores in the early day operations and are said to have produced several million dollars but have since remained neglected.

The possibilities of these properties are by no means exhausted as some splendid bodies of low grade mineral are still in evidence and some further extensive development at depth is warranted in a limestone formation and is very apt to reveal additional chambers of the rich ore for which these mines were formerly noted.

Silver Rule-Livingstone Mines.—The Silver Rule Mine of this new company has been operated to some extent and is said to show evidences of additional ore reserves. This

deposit contains high values in silver, lead and gold and it is figured from its nearly horizontal position that it is a breakover and that the apparent source of the ore in a steeper pitching vein still remains to be developed.

Extending from the Silver Rule over the mountain on the East Fork slope of Salmon River, the adjacent properties are the Transvaal and Livingstone Mines.

The Transvaal is in the same formation as the Silver Rule and carries a very similar character of ore, which strengthens the chance of additional shoots being discovered between the two properties.

The Livingstone Mine, on the same strike towards the East Fork, is one of the most persistent lead silver veins in the county, whose outcrop can be followed at the surface for hundreds of feet. It has a limited amount of development at depth but has been opened at short intervals for over 1,000 feet in length.

Its numerous shallow openings disclose an ore course from a few inches to several feet in width carrying rich concentrating and crude ores, which promise quite an important tonnage if more thoroughly developed.

The rugged mountainous uplifts of ancient sedimentary rocks and recent igneous intrustions that characterize this region between the upper East Fork on the south and Garden Creek near Challis on the north, along the Salmon River, has a great many promising prospects in lead-silver and copper-silver ores, and with the revival of interest and a local market for the ore afforded by the operation of this little smelting plant at Clayton, which is centrally located for this extensive mineral territory, a good deal of interest should be taken in its many flattering prospects, which, with additional development, will no doubt result in the discovery of other profitable mines.

Empire Mines.—The most active mining district in Custer County this year was that of the Mackay District, at the terminus of the Salmon River railroad on Big Lost River. At this point the Empire Copper Company oper-

ated their very extensive properties under the management of Mr. Frank M. Leland and gave employment to over 100 men, who were divided into small leasing parties, for which method the property is especially adapted by reason of the fact that the ore occurs in a number of pipe-shaped separate channels and masses scattered over quite an extensive area.

This property has had quite a checkered career and several important revivals of operation during the past 20 years.

Its surface manifestations indicate a probable great source of copper ore by reason of the occurrence of enormous bodies of heavy iron mineral carrying light values in copper at the surface and occasional shoots of very rich copper ore of the carbonate and oxidized varieties

The main deposits occur at a contact between eruptive granite and ancient blue limestone and are associated with an immense development of garnet rock.

The iron ore and garnet formations are in places over 200 feet thick, in addition to which the overlying limestone formations are intruded with numerous large dikes of quartz porphyry, which make short bends or flexures at intervals along their strike, and in these points of divergence in the porphyry dikes some remarkably rich and persistent pipes of high grade copper ore have been found.

The main deposit has been opened by a vertical shaft and cross-cut tunnel connected with the same at a depth of 700 feet, from which a large amount of ore has been extracted.

The property was formerly equipped with a large smelting plant, but the ore production of the mines proved too low in sulphur for successful treatment on the ground and the recent operations have been made possible by the advance in the price of copper and the reasonable freight and treatment charges accorded the ore, which is now shipped to the Salt Lake Valley smelters,

where it is used in combination with other ores to advantage by reason of its excellent fluxing values.

The leasing operations on this mine during 1912, together with a small force of men employed by the company, produced a gross yield of 25,000 tons of mineral which averaged about 6 per cent copper, $1.50 gold, and 3 ounces silver per ton.

Some shipments of clean carbonate ore were made that ran a good deal higher, but hardly anything was sent to the smelter under 5 per cent, and of the numerous ore shoots which were worked nearly all continued to show encouraging strength at the bottom workings of each operation, which has encouraged the company to undertake quite an extensive plan of deeper development by the extension of the Van Ostrand tunnel.

This tunnel has already been extended into the steep mountain on which this property lies a distance of 1,000 feet, and when completed will tap the ore channels 900 feet below the Alberta tunnel on the property, where it is not unlikely the different separate ore channels shown near the surface, and in the Alberta tunnel workings, will concentrate into one or more main trunk channels and produce an important resource of sulphide ore that may be treated to advantage on the ground.

The active operation of this property has proven a great help to the business of Mackay during the year and has also stimulated interest in the other proming copper prospects of the district.

Phi Kappa Mine.—Another likely mining enterprise in progress tributary to Mackay is that of the Phi Kappa Mine on the Upper Lost River near Mount Hyndman.

This property has been taken over by the Federal Mining & Smelting Company of Wallace, Idaho, who are now running a 400-foot tunnel to tap the deposit at further depth. Its deposits consist of a wide dike of igneous rock richly sprinkled with gold and silver bearing lead and zinc sulphides.

The dike in which these minerals occur is of large size and very persistent for hundreds of feet in length and indicates an enormous resource of concentrating ore.

The porphyry gangue in which the mineral occurs is light and the sulphide crystals are coarse and readily separated and will form an ideal concentrating mineral on which it is believed a successful separation of the zinc and lead values may be made to clean shipping products, and it is sincerely to be hoped that the present flattering values in the ore bodies will be maintained at the new level being sought by the present development at this point.

Lost Packer Mine.—In the upper Salmon River camps of Custer County a rather dull mining year was experienced.

A small force of men were kept employed at the Lost Packer Mine at Loon Creek, which has been undergoing development for two years and now discloses a resource of ore that is estimated at several hundred thousand dollars in gross value.

This property was recently described in the Technical Press by one of the well known engineers of the United States Geological Survey

It is a very interesting deposit, containing higher gold values than any other copper ore deposits in the State. It is equipped with a 100 ton hot blast pyrite smelter that has made three short runs since it was installed several years ago, aggregating a total of 4½ months, from which limited operation a gross output of nearly half a million dollars in gold bearing copper matte has been made.

The ores treated have run from one to three ounces gold and from 8 to 10 per cent copper. It is the intention of this company to harvest the present ore reserve with a single run of the smelter next summer and pay a dividend.

The vein on this property, while small, has proven quite persistent in depth but has been badly troubled by cross faulting, and several igneous intrusions since it was

LOON CREEK PLACER CAMP

formed have complicated its development and the search for ore bodies.

The resources of the mine are particularly well outlined at this time down to the 10th level through a succession of adit tunnels driven in on the course of the vein from the surface, and a handsome margin of profit is anticipated from the property next season.

Loon Creek Placers.—At Loon Creek, just below the Lost Packer Mine, the Loon Creek Placer Mining Company pushed to completion the equipment of their extensive placer holdings at this point, which comprise all the productive old diggings that made a large yield of gold bullion in early days as well as the adjacent virgin bars tributary to the main stream. Their equipment now consists of a five foot flume 3,900 feet long, which, in connection with a ditch, will give a head of 150 feet and an unlimited supply of water for hydraulicing the extensive area of gravel beds which the property covers, which are said to contain an average value of 28 cents per cubic yard.

The gold in this gravel is quite coarse and nuggets up to as much as two ounces have been found.

This company expects to operate two giants in the spring and are likely to make a profitable yield of precious bullion before the close of the piping season of 1913.

Sheep Mountain Country.—Southwest of Loon Creek the numerous showings of the Sheep Mountain, Seafoam, the Greyhound Mountain, and other tributary districts were the scene of a good deal of prospecting work during the past summer.

In this section the Burns Company, whose properties embrace some splendid showings of rich smelting and milling ore, was under negotiations for sale, but the enterprise was defeated by the inaccessibility of the district.

This extensive general district on the upper tributaries of the Middle Fork of Salmon River carry a remarkable variety of ore courses, embracing lead-silver, gold and cop-

per ores. The values are mostly associated with sulphide minerals and involve smelting for their most successful treatment, but owing to their remote situation from railroad transportation it has been difficult to get capital to undertake their operation on a large scale.

These deposits embrace a number of very large veins containing good values in gold and silver, but low in lead and copper, that may possibly be treated by modern chemical processes after concentrating out the heavier smelting ores.

The district as a whole contains an immense tonnage of valuable minerals that would afford several large and profitable producers if given the advantage of railroad transportation facilities, and preliminary to its recognition from railroad capitalists it is almost imperative that it be given the benefit of better wagon roads, and I highly endorse the movement now on foot to induce the State to construct a substantial highway into this country from the Snake River Valley up the South Fork of the Payette River, for its manifestly extensive mineral resources and values would ultimately result in the development of a valuable market for the farming and business interests of southwestern Idaho counties, which would be immediately stimulated by improving its accessibility in this manner.

Willis Dredge—The gold dredging enterprise of the Willis Company completed a number of improvements on their dredging plant at Stanley Creek, and this dredge, which is of the bucket elevator type, was operated intermittently on several test runs for the purpose of trying out new equipment and endeavoring to arrive at the most economical method of handling the gravel and making a successful separation of its gold contents and interesting by-products of black sand. The black sand residue in this deposit from the dredging operation is shown by numerous tests to contain high values in gold, after all the free placer gold has

been amalgamated out by ordinary methods, and it is also reported to contain quite an appreciable value in platinum.

Much time was spent by the management last season in experimenting with the various processes for the recovery of these mixed values. This seems to be a wise course, as the deposits have been noted in the past for the serious loss of gold by the ordinary methods of operation, and it is evident from present experiments that this by-product of concentrates which has formerly gone to waste contains nearly as much value in gold and platinum as was obtained in gold from the former operation, and if it can be successfully recovered and separated it should make a decidedly added opportunity of profit to the enterprise.

Besides gold and platinum, the heavy residue obtained from treating the gravel on this property contain quite a notable amount of cinnabar sand, mercury sulphides and other rare and valuable minerals. Several concentrating appliances have been tried out on the dredge in addition to the ordinary sluice box method of saving values and the management believes that a simple, practical and economical method of recovery has now been worked out and that the next season's operations will show very profitable results.

These gravel deposits carry an objectionable layer of talcy material, which has given considerable trouble in the past operations of the property, and additional machinery has been added to the dredge which disintegrates this material before going into the sluices and has largely eliminated the former trouble from that cause.

CLEARWATER COUNTY.

The principal feature of mining interests in this county is at the old placer district of Pierce City, where small hydraulic and sluicing operations are still continued and produce considerable gold. In addition to these, the most important operation in this district is that of a small dredge a short distance above Pierce City that is doing excellent work and is said to be recovering over 25c per cubic yard of the gravel handled.

Another dredging operation at Pierce, financed by Chicago capitalists, has been poorly handled and remained idle most of the year.

It is also situated on excellent ground that carries good values, as tested by actual working tests and drilling and estimated to average 30c per cubic yard, but this dredge was poorly designed and is equipped with a very expensively operated steam power plant that increased the cost of operation to a point that leaves hardly any profit.

There is now electric power available in this district and a few thousand dollars would change the power design of this plant and greatly reduce the cost of its operation and permit a handsome margin of profit.

A movement was recently on foot for the purpose of taking over this property from its present owners and reconstructing the power plant, and if this transaction is successfully consummated it will doubtless result in doubling the present dredging gold output of the Pierce District.

ELMORE COUNTY.

The mining industry in Elmore County during the past season was extemely dull and the total output of gold, approximating 3,500 ounces, was largely derived from leasing operations on the Homestake Mine in the Neal District, near the border of Boise County, and from other small leasing operations and the placer deposits of the Elmore Placer Company at Junction Bar. The latter property was under development the greater part of the year and is now believed to be in such shape that a bigger production may be anticipated from the property next season, as it carries an extensive tract of relatively high grade placer gravel and it has now a complete equipment and extensive plans of preliminary development have been completed.

The usual amount of prospecting work was done at the different camps of the county, but no important capital investments ere made in extended mining development.

Boise King Placers—The Atlanta country experienced a particularly dull year, with one exception, that of the Boise King Placers, a few miles below Atlanta on the Middle Boise River.

On this enterprise a large amount of capital was invested in flume construction for the purpose of conveying a large flow of water to be delivered under a good pipe head for hydraulic purposes.

This company owns an extensive tract of river bar diggings on both sides of the river in Elmore and Boise Counties, and from the progress made with the work during the past year it is likely that before the close of next season it will be finished and the merits of the ground determined by actual hydraulic operations.

FREMONT COUNTY.

This is one of the largest counties in the State and embraces one of the most extensively developed agricultural areas in the Snake River Basin. It is bordered, however, along its east and north boundaries by high mountain uplifts, and on its western edge is penetrated by the terminal ends of the Birch Creek Mountains. These mountains run to very high elevations and form a great snow reserve for subsequent irrigation and draw moisture sufficient in the spring months for an extensive dry farming industry.

Scott Mine—In the northwestern corner of the county, near Kaufman, is the Scott Mine, a lead-silver deposit that has undergone considerable development and has made a number of shipments of high grade hand sorted ore and continues to present an attractive venture for more extensive development at depth.

Weimer Mine—North of the Scott Mine, along the west slope of the main range, there are several other very promising lead-silver prospects, and continuing north to Skull Canyon, the Weimer Copper Mine presents an interesting geological problem.

This deposit somewhat resembles the copper stained quartzite manifested at Bingham, Utah. The ore occurs in a series of flat dipping seams and vertical joints of rich copper oxides and carbonate ores, a contact between blue limestone and quartzose sandstone.

A good deal of shallow surface gouging has been done on this deposit following the stringers of rich ore and a number of carloads of high grade picked mineral has been shipped from former operations.

A little work was done on the property during the last year and the present ownership is seriously contemplating

LOADING CHUTE, 200-FOOT LEVEL, BROWN BEAR CREEK COAL MINE
FIVE-FOOT VEIN

HORSESHOE COAL MINE CAMP, TEN-FOOT VEIN

the introduction of a diamond drilling plant at this point before any further development work is done.

The ore distribution is continued along the contact of the two formations for nearly a mile. It extends well up into the limestone at the north end and well down into quartzite at the south end of the property, where some vertical fractures and bedded segregations contain some interesting copper sulphide minerals, including chalcopyrite, and bornite, and the extensive distribution of the ore rather indicates the considerable source and concentration of mineral at some point. A systematic drilling of the ground may determine its merits in the most satisfactory manner.

Coal Mines—Near the eastern border of Fremont County, on Horseshoe Creek, are situated Idaho's most likely source of commercial coal, and at this district considerable activity was displayed by the owners of the best developed claims, including the Horseshoe and Brown Bear, covering an area of less than two sections, in an effort to secure title from the Government.

This effort has been stimulated by the construction of the Short Line Railroad from Ashton on the Park Branch of the O. S. L. to Driggs, which passes within ten miles of the coal mines, and a survey has been made up Horseshoe Creek to the mines, where it is found an easy grade can be obtained for the extension of the spur track.

These deposits have been operated in a small way under development for the past seven years, during which time seven or eight thousand lineal feet of development work has been done, disclosing two splendid veins of high grade sub-bituminous coal of the Rock Springs variety in veins from 2 to 10 feet thick. The principal development has been on the 5 foot vein and the 10 foot vein. These veins are quite clean and free from bone and give the following average analysis from a series of tests:

	P. C.
Fixed carbon	55.65
Volatile carbon	36.62
Moisture	3.13
Ash	4.10
Sulphur	.50
Total	100.00

The actual fuel contents are 92.27 per cent.

These properties are owned by Idaho people of small means, who have consistently endeavored to comply with the law since they were discovered and acquired, and they have succeeded in demonstrating the existence of a very important tonnage resource of desirable domestic coal.

Experience has shown that the veins are considerably disturbed by vertical cross-faulting, there is, nevertheless, definite evidence produced by the development of the existence of a large reserve of valuable fuel that is susceptible of making a good sized commercial coal mining enterprise when more fully opened and equipped and is of decided community interest to south Idaho, which at present has to import practically all the coal fuel it uses at a very high cost to the consumer.

These deposits have been situated on unsurveyed public lands and forest reserves, which, subsequent to their discovery, have been further withdrawn from public entry by the Government for coal classification and valuation purposes, and part of the same townships for phosphate resources.

The particular land on which the best coal showings were made were unfortunately situated at a township corner, which involved the necessity of surveying 4 townships, and the cost of this survey had to be advanced by the coal claimants, which, however, under the law, will be credited on the purchase price from the Government if title is allowed. A special effort has been made by the principal claimants to perfect title on a limited area of

this land by having them restored to entry where coal deposits of demonstrated merit have been proven to exist, and it is sincerely to be hoped that an equitable view of the matter will be taken by the Federal authorities in regard to these claims, as it is impossible to undertake their extensive development until title is acquired. In the meantime an extensive tributary agricultural community is paying excessive retail prices for their coal requirements that would be reduced fully 50 per cent by the more extended operation of these deposits.

In the shallow development of the Brown Bear claim the work produced a good deal of slack coal. The accompanying cut illustrates a thousand ton dump of this fuel which has been spoiled by spontaneous combustion, as the heart of the dump is burned out and reduced to ashes.

The lower development on this vein, however, at about 200 feet, shows a much firmer fuel and its operation has produced a much less slack fuel, all of which has been marketed with the thresher people, among the rapidly expanding grain producing areas of the adjacent plains. This slack coal is sold for 50c per ton; the fine nut grade, made from a little larger screen, at $2.00 per ton, and the lump coal at $3.50 per ton.

There has been several thousand tons of coal produced in the process of this development, and this limited supply, during the fuel famine periods which have occurred several times in the past seven years in severe winter weather, has proven of great benefit to the nearby settlers, who at the present time are paying as high as $9.00 per ton retail at the railroad for their coal requirements, and many of them have as long a wagon haul from the railroad as they do from the mine.

IDAHO COUNTY.

Idaho County, the largest in Idaho, aside from its extensive area of agricultural land north of Grangeville, the county seat, presents a very rugged, mountainous topography and is essentially a mining county, being as it is almost entirely embraced with the main central granite area for which this State is noted. It has had a very flattering future from a mining development standpoint in general, especially in connection with its gold ore resources.

This county was noted in the early history of the State for its placer production, and the diggings of Florence, Warren, Elk City and Salmon River made an enormous yield of precious bullion from this class of deposits.

There is hardly a stream of any importance in the whole country upon which placer gold cannot be found by panning, and while it is true that the granite formations of this region have been deeply eroded, there are several districts in which immense intrusions of recent tertiary igneous rocks are manifested that have been accompanied by extensive mineralization of a date subsequent to the general erosions of the granite formations and are consequently susceptible of maintaining their metal values to very considerable depth.

Such a condition as this exists in the Big Creek District, situated south of the main Salmon River and between the South and Middle Forks of that stream, centering particularly around the head of Big Creek, a large mountain stream that enters the Middle Fork of Salmon River 12 miles above its confluence with the main Salmon River.

This district is approached from the railroad at Grangeville and at New Meadows, both of which are

U. S. POSTOFFICE, YELLOW PINE BASIN

U. S. POSTOFFICE, KNOX

SCENES ON SOUTHERN ROUTE TO BIG CREEK

branch terminals, over State built wagon roads that have been extended by private parties.

These roads, however, traverse a very rough and high country, were poorly built, and are in poor shape at the present time for heavy hauling. A new State wagon road is proposed for this district, extending from Thunder City on the new Short Line railroad now being built up Long Valley. This road follows the old Thunder Mountain road to Johnson Creek 40 miles; then down Johnson Creek to Yellow Pine Basin; then up the East Fork to Profile Creek, and up Profile Creek to Profile Gap; then down Big Creek to Edwardsburg. The construction of this road would greatly improve the accessibility of this important district, while the highest elevation on this proposed route is 7,100 feet, at Profile Gap, as against 9,000 feet, at Elk Summit, over the other route. This southern route would also greatly extend the open season for hauling to Big Creek, and the approaches to the higher elevations are much more gradual and much easier than over the northern route. The new road is in soft granite formation all the way and would be easily kept in repair and could be easily maintained as a sleigh road in the winter time.

BIG CREEK DISTRICT.

The construction of this road, I believe, would do more to stimulate interest in central Idaho's mining resources than any other outlay of State funds I can imagine, by reason of the magnitude of the deposits of this district and their business creating possibilities.

The Big Creek District is very extensive in area, and in connection with some less developed districts, like Ramey Ridge and Profile and other closely tributary sections, embraces a remarkable variety of base smelting ores and milling gold ores. Between Profile Gap and the North Fork of Smith Creek, in a course almost due north and south, there exists one of the most pronounced and richly mineralized ore zones that has ever been discovered.

This great mineral zone crosses the drainage system and its tributaries through rapidly varying elevations, ranging from 6,000 to 9,400 feet, due to the deeply eroded canyons and sharply outlined mountain spurs that cross its course in rapid succession through a distance of 15 miles.

The south end of this belt on Profile Creek shows some very flattering manifestations of lead, zinc and copper sulphide minerals, invariably associated with good gold and silver values, and in some instances showing very high silver values.

From Profile Gap north to Smith Creek the values run particularly to gold and silver, although some important copper assays have been obtained from some of the big iron sulphide ore bodies.

The most noted vein or zone of this belt is identified throughout its length from the Independence and Blaine Mines on Smith Creek and extends to Profile Gap. It consists of a quartz filled fissure zone with conspicuous outcrops that is from one to three hundred feet wide and strikes nearly due north and south in its general course and dips east at an angle of 50 to 60 degrees

Its several spurs of roughly parallel courses of mineral of similar great magnitude have proven in several instances on the Gold King, Laufer & Davies, and the Moore groups to be upward of 200 feet wide and carrying their dominant values in gold, while the Independence Base vein, so-called, carries about equal values in gold and silver

The general formations of this district are the well known coarse grained eruptive granite of central Idaho, which along this belt has been extensively intruded by monstrous dikes of igneous rock with accompanying evidence of intense solfataric action that succeeded the intrustions and accompanied the mineralization.

Parallel to this vein, on the slopes of Logan Creek, there is a narrow belt of high metamorphosed sedimentary for-

mations, including steeply pitching narrow beds of quartzite slate and marbleized limestone, which indentify the eruptive character of the graniite, and some associated wide zones of clear garnet further east probably indicate the replacement of other sedimentary inclusions.

Independence Mine—The Independence vein, on a large group of claims of that name, carries a bold outcropping of quartz two to three hundred feet wide that is exposed on the steep mountain sides on which it occurs for fully a mile in length. It has been penetrated with a cross-cut tunnel fully 212 feet long, and an apparent hanging wall of andersite porphyry with a wide clay gouge may prove on further cross-cutting to be a more recent dike.

The outcrop of this great lode is a lean looking and intensely shattered white quartz with occasional patches of bluish, fine grained honeycomb structure. The cross-cut tunnel referred to is very richly mineralized throughout its length with iron pyrites showing a good deal of purple fleurite stain, and the inner 60 feet of this tunnel carries fully 50 per cent of its bulk in bright, yellow iron sulphides, contained in a ground mass of milky, white quartz.

The balance of this great ore body disclosed has a more scisty quartz structure and is also quite richly mineralized.

Large average samples, amounting to 75 pound lots, were taken in 10 foot sections through the length of this cross-cut and were shipped to Denver to be worked down and are said to have given an average assay value of between $4.00 and $5.00 per ton in gold and silver.

Some recent tests on tarnished looking iron sulphides from this cross-cut are said to have yielded from 1½ to 2 per cent copper.

Numerous cyanide tests, however, on the treatment of this ore have shown very satisfactory extractions, up to

90 per cent of the combined gold and silver values, the silver showing as high recovery as the gold.

Two thousand feet north of this first cross-cut another cross-cut tunnel into this great mineral body is 300 feet long in quartz the entire distance and carries from four to five per cent of iron sulphides and is said to average around $3.00 per ton in gold and silver, while numerous intervening surface cuts made along the strike of the lode at favorable looking points in the great outcroppings have yielded assay results of from $1.00 to $10.00 per ton.

There are two parallel veins west of this great mineral course within a few hundred feet of it that have been opened by shallow surface work at numerous points and indicate some great mineral channels from which values have been derived varying up to $10.00 per ton in gold and silver, but at no place have they been fully cross-cut.

These are massive quartz bodies, in places very richly impregnated with iron sulphides and occasional galena and copper sulphide crystals, which present some very attractive chances and afford some splendid sites for further development by tunneling.

Gold King Mine—South of the Independence group about two miles, and a few hundred feet east of the same monstrous manifestation of white quartz, the Gold King group carries a parallel mineral zone of a slightly different character. This deposit is a dark brown stained highly silicified zone of mineral bearing rock of undetermined width. It is partly covered with soil but shows a succession of low outcrops at the face of the steep mountain side where exposed and is characterized by thick bands, patches and seams of brown honeycomb quartz across the width of 100 feet, with neither wall limit disclosed, but showing a continuity along the strike of several hundred feet. The more favorable points along the outcrops of this deposit show splendid panning values in bright free gold that indicates gold contents of from $5.00 to $20.00 per ton.

A cross-cut tunnel has been started to determine the width of this zone, which is now in 70 feet. Five foot samples throughout the entire length of this cross-cut, taken by competent engineers, indicate the average values of the body so far exposed of $3.72 per ton, of which 90 per cent is gold. The oxidized ore shown at the surface is entirely absent on this shallow cross-cut tunnel, which presents a highly silicified granite gangue through most of its length, carrying thick bands and stringers of nearly solid iron sulphides, the sulphides being also well disseminated through the grain of the rock. These sulphides when burnt show a little free gold, and as clean concentrates gives assays ranging from $50.00 to $70.00 per ton in gold.

The surface work indicates that the best paystreak of this great body of mineral yet remains to be cut by the cross-cut tunnel now being extended toward the footwall. The hanging wall limit of the deposit is undetermined, as it is deeply covered with surface soil, but if the experience met with in the Independence development is followed out at this point valuable ore should be encountered on the hanging wall side of this deposit, which indicates from the present position of this work that it will have a total width of not less than 150 feet.

Laufer & Davis Mine—The Independence Base vein is richly mineralized with iron pyrites, and the east vein, shown on the Gold King group, is continued in bold outcroppings throughout the length of the adjacent Laufer & Davis group, to the south, up the opposite side of a very deep and narrow canyon and over the adjacent summit for a distance of a mile.

On this latter group the east vein has been prospected with some shallow surface trenching, which, sampled in 5 foot sections, gives similar values to those found in the Gold King tunnel. In addition this east vein has a small spur vein striking northeast that is from one to three feet

wide, developed by a 50 foot tunnel, and carrying a rich yellow honeycomb quartz at the outcrops that gives free gold panning results from $50.00 to $100.00 per ton. Underground this ore is heavily mineralized with lead, zinc and iron pyrites and occasional splashes of grey copper mineral, and gives similar high results in assays to the surface panning rock in gold and silver, with selected specimen samples showing grey copper mineral that runs very high. This property has a tunnel at the base of the mountain driven in several hundred feet for the purpose of developing the base vein, which could be opened up and tested at considerable depth by a little additional cross-cutting from this tunnel.

From the high summit between the forks of Logan Creek, near the south end of the Laufer & Davis group, the big base lode shows several cospicuous and characteristic outcrops down the steep mountain slope into Logan Creek, and on the opposite side of Logan Creek it has been followed and opened by several cross-cut tunnels almost to the Big Creek divide. Two miles still further south, and at these openings, it shows some massive iron sulphide quartz mixtures, but at no place has its full width or merits been determined.

The best showing of this vein at the south end is on the Hercules group, on a small tributary of Logan Creek called Moore Creek. A short distance east of the Hercules group, traversing a steep mountain slope in a northeasterly direction, is situated the Moscow Mine, better known locally, as the Moore Bonanza. This group is believed to make a junction with the base vein near the south of the Hercules group.

Moscow Mine—The Moore Bonanza, so-called, is 250 feet wide, as determined by surface prospecting cuts, and light pannings of free gold may be obtained from the more favorable looking gangue of this great zone throughout its entire width. This deposit has been traced along its strike for over a mile on this group of claims and at one

GLORY HOLE BOTTOM AND DISCOVERER, MOSCOW MINE

SIDE VIEW OF GLORY HOLE, MOSCOW MINE, BIG CREEK

point is opened by cross-cut tunnel 200 feet long that has attained a face depth of 150 feet. This tunnel is started in the foot wall formation and extends into the vein 150 feet and from the tunnel two raises have been put up to the surface and around them a glory hole quarry has been opened. The tunnel is connected by a light rope tramway hung on the tree stumps to a crude five stamp mill on the small tributary stream 800 feet below.

This deposit has the appearance of a sheered zone. Its predominant gangue is shattered quartz with highly altered richly mineralized granite gangue. The ore is free milling for a depth of about 40 feet below the surface when it changes into a richly disseminated iron sulphide ore.

The glory hole quarry, shown in the accompanying cuts, has produced about 1,500 tons of ore that is said to have given an average yield of $5.00 per ton in free gold.

The milling appliances are of the crudest nature and were roughly handled with inadequate plate surface, and it is probable that a rough selection was made of the better material mined from this quarry to obtain the results mentioned.

I took a few samples in the sulphide horizon disclosed in the main cross-cut tunnel in 1911 that gave an average assay value of $6.00 per ton in gold and silver, 85 per cent of the values being gold. Some cyanide tests made on the concentrates from these samples show an extraction of 96 per cent of both gold and silver values by fine grinding and agitation for 8 hours in an 8 pound solution.

During the past season this district has attracted considerable attention from responsible mining investors and some engineers of note have visited this district and made examinations of its various properties. One of these examinations was conducted by one of the ablest authorities in the United States on the Moore Bonanza, and a thorough, cold-blooded sampling of 150 feet of ore disclosed in the main cross-cut tunnel gave an average assay value of

$3.00 per ton, while the central zone, 60 feet wide of more heavily mineralized iron sulphide ore, gave an average assay value of $4.40 per ton and cyanide tests on the concentrates showed an extraction of 96½ per cent. Panning rock in large boulders and shallow surface cuts have been found at points 1,200 and 2,000 feet northeast of this main development on the strike of the lode, and there is every evidence from the nature of this deposit, together with its great size and geological associations, that these values will be maintained to very considerable depth, presenting a probable resource of milling ore of good grade above a convenient drainage tunnel site in the main Logan Creek nearby that would amount to millions of tons.

With the natural advantages surrounding this deposit I see no reason why it should not be mined and milled at a total cost of $1.50 per ton, if handled in sufficient quantities with modern equipment.

This group itself, and the entire surrounding region for miles, is densely timbered with desirable mining material. The adjacent large mountain streams within a distance of 15 miles would afford an unlimited supply of hydro-electric power. A drainage tunnel could be driven on this great ore course that would attain a face depth of 1,200 feet within the length of the group, which would afford ideal advantages for cheap gravity handling, glory hole, and caving methods of mining, and I consider the property presents one of the most attractive chances for a mining development enterprise with the definite prospect of warranting the investment of the necessary capital for a milling plant of 5,000 tons daily capacity.

The natural advantages surrounding this deposit for economical development and operation are a decided offset for its admittedly isolated situation. The road to the property is not in shape for a heavy load of mining machinery, but the matter of transporting the necessarily heavy machinery for the equipment of such an enterprise,

as this deposit promises to warrant, would be easily taken care of after its values were proven to continue in depth.

This property has recently been optioned to some Seattle and Los Angeles capitalists, who have made a small payment on the purchase price and propose to undertake its extensive development to determine the tonnage extent of the values now disclosed in the shallow surface work before considering a milling equipment, and it is to be hoped that capital will be forthcoming for this part of the venture and the importance of the deposit determined before the close of another season, as its successful development means a great deal for this part of Idaho.

This part of the district has definite earmarks of containing at least a half dozen other groops of similar capacity from which a great tonnage of milling ore may be expected and whose succesful development and treatment would result in the establishment of one of the most populous mining districts in Idaho at this point.

In addition to this big gold bearing zone, especially in the Ramey Ridge section and other tributary drainage branches of Big Creek, there has been discovered and partly developed numerous attractive gold ore deposits that will probably warrant the establishment of mining and milling enterprise of smaller caliber based on ore shoots from a foot to ten feet wide, carrying values from $5.00 to $20.00 per ton. The region a few miles east and south of the big lode gold belt has some flattering copper prospects, carrying oxidized and sulphide copper ores in well marked fissure veins. One of these copper sulphide deposits in a patch of ancient metamorphic rock overlying the granite carries an appreciable amount of nickel, associated with phyrotite. Another interesting mineral deposit of this region having an evidently important tonnage resource is cinnabar ore, occuring both in placer and lode form. This is one of the most sparsely populated and roughest mountain regions of the State, exceptionally

well watered and timbered, and a most attractive field for mineral discovery and investigation.

MARSHALL LAKE DISTRICT.

Very little new work was done in the Marshall Lake District during the past season. The most active operation at that point being that of the Mount Marshall Mines Company, Limited, which worked a small force driving a long cross-cut tunnel for the purpose of tapping their vein system at considerable depth.

This tunnel has recently penetrated one vein of the system, and drifting is now being done on its course at the present time. It will take considerable work, however, to fully determine the merits of the further deposits on this property. The Marshall Lake District, with its many splendid prospects of high grade gold ore, still remains an attractive field for leasing operations and modest investments in mining development.

ELK CITY DISTRICT.

The Elk City District, on the South Fork of Clearwater River, enjoyed considerable activity in 1912 in the way of mining development and several small milling operations were in progress, the Elk City Mines Corporation being one of the most conspicuous enterprises of this district, which operated a five stamp mill during a good portion of the year.

This property carries a vein of good ore that is opened by tunnels to a depth of 400 feet, showing ore shoots 2 to 4 feet wide and 150 feet long. It also has a second vein 40 feet wide, which it is believed will yield good milling values and will warrant a much larger milling plant. This larger vein is desirably situated for deep development by tunneling and gives splendid prospects of a big tonnage resource of paying ore when more fully opened.

The Rio Tinto Mining Company are developing the American Eagle Mine in a substantial manner by sinking

below the lowest tunnel on the property, which formerly produced a good tonnage of high grade free milling ore. This mine carries a well marked fissure vein in granite, and during its former operation there were disclosed some notable rich specimen gold ore and good size chunks of almost clean petzite, or black telurium ore, that occurred in kidneys in the pyritic quartz gangue of the vein. The present development is being pushed below the water level, where the reoccurrence of this class of ore may be anticipated, and if it is found in shipping quantities it should prove immensely profitable.

The Brown Bear Mine of this district was developed during the year but got into financial trouble through over-optimistic promoting methods.

This is an attractive ore showing that has been opened by tunnels to a depth of 400 feet, and at one point shows a width of 52 inches of $30.00 gold ore, the main shoot being 75 to 100 feet in length.

The Parr Mine is another property with a splendid fissure vein that was operated during the year and is now being developed at the 100 foot level, where oxidized ore continues to give good values in free gold.

The Bengal group, southeast of Elk City, was also being worked, employing a few men on development, and some test runs of its ores were made by a new process at the Elk City Reduction Works that is said to have given excellent results and promises to prove of great value to this and adjacent districts in the economic solution of their metalurgical problems.

Three miles east of Elk City, on Kirk's Fork, the Mascot Mine was operated with a small force of men and made some mill runs in 3½ feet of Huntington metal.

The Little Butte Mine, south of Elk City, also operated a one stamp mill, and the Last Chance Mine made several runs with a 2 stamp mill on its property north of town.

DIXIE DISTRICT.

In the Dixie District, on the Salmon River slope, the Majestic Gold & Silver Mining Company, and the Penn-Dixie were both operated during the year in a development way.

An interesting mining revival occurred in the Buffalo Hump District during the year. The Jumbo Mine operated 10 of its stamps and employed a force of 30 men under a new ownership, and the management at the close of the year anticipated soon being able to supply an increased milling capacity, as the property is equipped with a 30 stamp mill conveniently situated to the mine. The Hump District has some powerful fissure veins that can be traced for long distances and give evidence of several large ore shoots with good values, but the extraction of the values has not been very satisfactory so far and it is to be hoped that the new process now being tried out at Elk City will prove effective in extracting the values of this district.

LATAH COUNTY.

Latah County, besides being one of the most prominent agricultural counties in the State in the humid plateau region of the Palouse country, carries some conspicuous mountain uplifts of granite formation that are quite well mineralized at several points throughout the central and western borders of the county, and contain some interesting deposits of copper, gold and silver ores, and some of the best commercial mica deposits that have been discovered in the western States.

Muscovite Mine—None of these mineral resources have been developed to an important stage as yet, and the prinpal output of the county, in addition to a little placer gold during the past year, has been from the Muscovite Mine, near Avon. This property was operated under a new ownership with a small force of men in charge of Mr. Joseph Pyne, an experienced mica miner from South Dakota, who shipped several cars of commercial mica during the year.

The Muscovite Mine has a lenzy vein of coarse pegmatite, varying from a gouge to 10 or 15 feet in thickness and contained in walls of schisty gneiss carrying a conspicuous development of Muscovite mica.

The commercial mica comes from big swells of the pegmatite, which are made up of massive segregations of the quartz feldspar and mica elements of the general formation. The mica segregations occur in oblong tabular crystals, called books, by reason of their fine leafy structure, that are occasionally found as large as 12x18 inches and one to two inches thick.

The operation of the deposit produces a good deal of scrap material and some mica of splendid quality that

splits up into perfect clean sheets of uniform texture and of a faint honey color, otherwise clear and transparent, which in the better books or crystals, produce some of the highest grade material that is found anywhere in the United States. This property is undergoing development with incidental shipments. The mineral is all shipped crude from the mines to eastern consumers, where it is cleaned and sorted into different grades for electrical insulation and other uses, and with the hope and prospect that it will afford a steady and important supply of this valuable commercial mineral, which, in the better grades, is in good demand.

The present operation of this property will doubtless determine its commercial worth and may result in quite an extensive mining operation of this class of mineral.

The district in which it is located has several other promising mica prospects, but this mineral is notoriously pockety and uncertain in its occurrence and involves a great deal of risk and preliminary expenditure in its development by reason of the inherent uncertainty and lack of uniformity in shape of the shoots in which it is found.

Considerable interest was manifested in the Troy Copper District. At this district, a few miles east of Troy, the O. K. Olsen Copper Mine was being developed by a small force of men through a vertical shaft that was 70 feet deep at the time of my visit in July. Through this shaft a cross-cut was being run that disclosed a series of bands of cuperiferous pyritic and dessimated copper sulphides in a formation of gneiss with decided schisty beds that in places disclose some high grade enriched copper sulphides containing good values in copper, together with excellent associated values in gold and silver when concentrated.

Extending from the O. K. Olsen Mine down the flat flowing creek, on the bank of which it is situated, for a quarter of a mile there are several other interesting prospects of similar nature.

This zone is mineralized with a scattering dissemination

of copper sulphides throughout its entire width for half a mile and includes some large porphyry intrusions.

In places the exposed granite bedrock of the creek bottom shows rich blue bornite mineral right at the surface when broken.

This great zone of minerals can be traced to the north for several miles. Its granite and schisty formations have been intensely altered by secondary metamorphic minerals in which garnet and epidote crystals are conspicuous and the copper minerals doubtless accompany this secondary action.

The locality immediately adjacent to the O. K. Olsen Mine presents some splendid chances for diamond drill work. From all the development which so far has been done, which is mostly of a shallow nature, it is evident that the ores of the district will continue to be low grade, with the exception of some narrow pay streaks, but when it is considered that fully 50 per cent of the copper production of the country comes from ores of less than 1½ per cent average values, deposits of this class are of much more interest to investors than formerly.

Some well known mining operators are figuring on the installation of a diamond drill in this district, which I think would be a most satisfactory manner of determining its merits, as there are several points in the district which promise to disclose zones of sufficient width and value in copper sulphides to warrant their permanent development with a view for their ultimate treatment for low grade values on a very large milling scale, and the drilling method would be the most economical means of determining their position.

The district is covered with a Columbia basalt lava flow and the copper bearing granite formations are only exposed by the eroded water courses.

The topography of the district presents a rather low relief of slightly eroded plateau features but breaks off quite

abruptly in the direction of the stream, flows to the south, and while it does not present any likelihood of bonanza shipping ores it is a chance for developing a deposit of the low grade disseminated class of immense tonnage capacity and is worthy of serious consideration and investigation by investors of sufficient means to undertake this class of mining development.

LEMHI COUNTY.

Gilmore District—The lead-silver ore deposits of Lemhi County, near the head of Lemhi Valley, in the Gilmore District, enjoyed a prosperous year of steady and important production.

This was especially true of the Pittsburg-Idaho, Latest Out, and the New Gilmore Mines, whose total yield of commercial mineral exceeded that of any other year in the history of their operation.

The Gilmore Mine is a new corporation formed by the segregation of the extensive properties formerly owned by the Allie corporation.

It adjoins the Pittsburg-Idaho to the east, and during the past season these two companies joined forces in the construction of a main working tunnel to be 2,500 feet long, which is being driven from two headings, one from the inside of the Pittsburg-Idaho and the other from the surface near the mouth of the gulch in which these properties are situated.

This work has been prosecuted with machine drills and it is anticipated that it will be completed by early spring.

A spur railroad has been extended from the Gilmore and Pittsburg railway station up to the mouth of this tunnel, and when it is finished and equipped with the necessary ore bins it will eliminate the present wagon haul cost and materially reduce the handling charges of the ore shipments. This tunnel is also being extended west through a third heading back into the mountains and will ultimately cross-cut the entire fissure system for which these two properties are noted, and also the Latest Out veins and the other important fissures that cross its course to the west. It taps the Pittsburg-Idaho deposit at the 400-foot level and the two inside headings have already disclosed

several new commercial ore courses varying from 2 to 5 feet in thickness that are destined to add considerable life to the property, and in connection with the adjoining groups combine to indicate the ultimate development of a big permanent ore resource of relatively high grade smelting ores. The deepest workings in the district have followed the main ore channel of the Pittsburg-Idaho Mine to the 600-foot level through a winze from the 400-foot shaft level.

The principal ore channels which have produced the largest resource of the mine in the past have been successfully developed on the 600-foot level, but on this horizon a flow of water has been encountered recently, which is the first water discovered in the development of the district, and will involve the installation of a pumping plant and probably a decided sulphide change in the character of the ore, which to date has all been of an oxidized and carbonate character.

The encountering of this water level has stopped development in the bottom of the mine temporarily, as it is undesirable to equip the works with a pumping plant until the new working and drainage tunnel is completed. The encountering of this water level is a mixed blessing, for while it may result in involving the construction of a concentrating plant in which to treat the ore below that horizon, it temporarily affords the source of a water supply which will come into excellent play by reason of a recent very severe spell of zero weather that has put the present source of water supply for the camp out of commission, which is conveyed by a pipe line several miles long and not sufficiently protected.

The mine has produced over 2,000 tons of crude shipping ore per month throughout the year and is in as fine shape at this time in the matter of ore resources as it has been at any time in its development since its original discovery, with several new veins that are likely to warrant, when fully developed, a greatly increased yield of mineral.

The Gilmore Mine Company's development is connected with that of the Pittsburg-Idaho through a separate shaft, which was put in excellent shape during the year and a systematic development of its interesting ore deposit has been continued with a small force of men, from which the production of a total of 14 cars of ore has been made and shipped.

O. K. Olson Mine—This deposit is within a few feet of the lead-silver veins of the Pittsburg-Idaho Company and consists of a well marked fissure containing clean brown iron oxide ore in bodies up to 10 feet thick and carrying gold values exclusively, with no lead or silver, a rather remarkable occurrence, as it is one of the uniform north and south fissures of the system that traverses this district and is accompanied by lead bearing veins to the east as well as west.

Its shipping values range from $20.00 to $40.00 per ton in gold, with a high excess in iron, and occasional specimen streaks are found that sample as high as 120 ounces in gold per ton. The lineal extent of the development on this fissure is still very limited and its chances for disclosing important pockets of this high grade mineral, when more fully developed, are of no mean importance, as has been experienced in similar formations, notably in Tintic, Utah, where single carload shipments, containing $100,000 in gross value have been made and is one of the attractive features of this interesting deposit.

The Latest Out Mine, immediately west of the Pittsburg-Idaho and operated on one of the same system of fissures, enjoyed a very successful year of production and new ore development, its operation including an output of 7,500 tons of profitable shipping mineral and 2,000 lineal feet of new work.

Its ore resources have been proven to a depth of 375 feet below the surface. This development has encountered five different ore shoots, which have disclosed a maximum

length of 100 feet and as much as 15 feet in thickness of clean shipping mineral, that have shown their strongest manifestation in their bottom horizon.

This mine is opened through a cross-cut tunnel and a steeply incline shaft and the management is undertaking the further development of the deposit in depth. All these ore bodies are on the same vein, while the property contains another parallel vein of considerable promise on which some preliminary development work has been started through an independent shaft sunk from the surface, and the enterprise at this date has a splendid prospect of continued profitable operation and expansion of its ore resources.

The success of these mines has greatly stimulated interest in the numerous flattering prospects for which the immediate and adjacent districts are noted, and several small shipments of ore were made from these newer enterprises during the year, notably among which were four carloads of profitable ore produced by the Iron Mask Mine, under the management of Mr. P. H. Clark, one of the most persistent of the pioneers of the present development period of this old district.

The Iron Mask is situated in Spring Mountain Gulch, a few miles south of Gilmore, and its new ore development, made at considerable depth on the property through a long cross-cut tunnel, may mean a considerable resource available for further stoping, as it occurs at such depth under the surface so as to leave room for an important reserve above that will be easily available for further development and stoping operation, and is a gratifying reward for Mr. Clark's years of effort and faith in the property and that of his associates.

Other carload shipments of good ore were also made from the Fairview claim and the Highes group in Democrat Gulch, about two miles north of Gilmore, from the Groom's Snowshoe, Hard Scrabble group, and from the Portland group and the Brown Bill claim. Each of these

properties carry attractive showings of rich lead-silver ore, and their further development is very likely to result in the opening up of additional profitable resources of shipping mineral.

The last two mentioned properties are in quartzite formation that underlie limestone horizons in which the principal ore producers are being operated and is a decided feature of probable strength and permanency of the district, definitely indicating as it does that the limestone ore deposits will continue productive through the 2,000 feet of limestone beds in which they occur and continue down the quartzite core of the mountain promising great permanency and long life for the district, as has been experienced where similar geological conditions prevail in other noted lead-silver districts of the west.

In addition to the smaller shipping properties I have mentioned, there are several other enterprises of a smaller nature being worked by lessors and owners with good prospects of developing paying ore, and if the present favorable market is sustained for lead and silver there seems hardly any question that the Gilmore District will continue to expand its ore resources and production indefinitely.

The Gilmore District has been undergoing in investigation and study for a short period for the last three summers by members of the United States Geological Survey with a view of mapping and reporting on its geology and ore deposits, and if that Federal department could only get busy and give the operators the benefit of their research by published reports they would no doubt prove of inestimable value to the development progress of this very promising field.

Considerable prospecting work was also in progress on the opposite side of the valley from Gilmore in the Nicholia and Birch Creek sections near the southeast corner of Lemhi County.

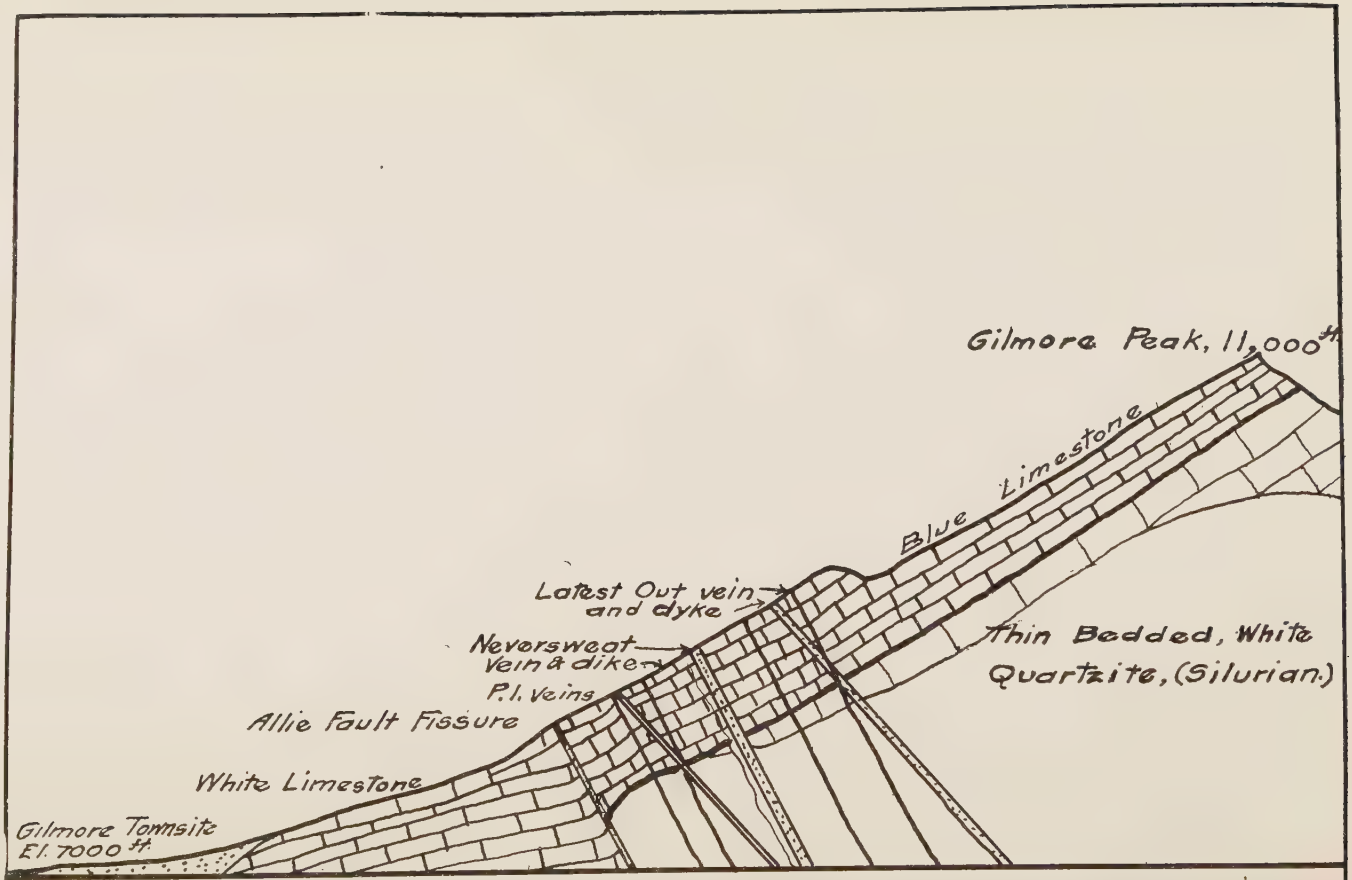


Diagram Cross-section of the Gilmore District Veins

The accompanying diagram will give a rough general idea of the formations and the relative positions and groupings of the parallel ore bearing fissures in the immediate vicinity of the principal producers.

The quartzite core of the mountain shown in the cross section is well exposed by erosion of some of the nearby canyons that cut back into the heart of the range.

The age of this quartzite is not definitely determined, but it is doubtless as old as the silurian and probably cambrian, as evidenced by the ancient fossiliferous limestones that overlie it, whose identity has been definitely reconized as low as the Devonian horizon.

The quartzite formation, in connection with some intruded porphyry dikes at a point two miles northwest of Gilmore, are exposed by erosion one-half way down to the valley from the summit of the high range and embrace several flattering prospects of lead-silver ore, in which the silver values are relatively higher than in the limestone lead ores. These quartzite beds are very pure silica, white and vitreous, and fairly fine grained, and in some respects resemble the cleaner faces of the famous ore bearing revette quartzite in which the Coeur d'Alene ore bodies occur.

Leadore Mines—At Leadore the Leadville Mines of the Junction Mines Company was the most prominently operated property and shipped 16 carloads of ore carrying an average value of about 30 per cent lead and 20 ounces of silver per ton. This property has considerable development, but through internal dissensions of the stockholders it has not been handled as systematically as its manifest merits warrant.

North of this property some rich lead-silver ore was found in the Grizzly Hill District and a small shipment of ore made.

There was also considerable prospect work done at other points along the Leadville contact, a very pro-

nounced junction of limestone and quartzose formations that carry a succession of interesting lead, silver and copper prospects for several miles in length.

Tungsten Mine—West of Leadore about 18 miles on the opposite slope of the Salmon River Mountains, the tungsten ore deposits of the Idaho Tungsten Company are situated on Patterson Creek. This property was being equipped with a concentrating mill of 100 tons daily capacity at the close of the year and is likely to become a profitable producer of this desirable rare mineral during 1913.

Kirtley Creek Dredge—In the gold producing sections of Lemhi County the Kirtley Creek Gold Dredging Company successfully operated its big new chain bucket elevator dredge throughout the year, with the exception of two months when it was put out of commission due to breaking some turbine runners in the power plant, on the Lemhi River, which supplies the dredge with electric power. This dredge turns over about 100,000 cubic yards of heavy gravel per month, which, considering the nature of the ground, carrying as it does an excess of heavy, flat slabby boulders, shallow bank and uneven bedrock surface, is a very creditable record, especiallly when it is considered the operation was maintained throughout the winter months during periods when the thermometer reached as much as 22 degrees below zero. This plant has made a successful saving of the gold values substantially matching the preliminary prospectings tests made before the plant was installed.

Its success has stimulated interest in adjacent tributary streams carrying extensive deposits of placer gravel, notably on Bohannan Creek and Geertson Creek. Both these streams originating in the main range of the Rockies, like Kirtley Creek, carry several miles of gravel beds which have been operated to a limited extent by hydraulic methods in past years and are known to contain paying values if handled in sufficient quantity. They have been under

GILMORE PEAK, 11,000 FEET ELEVATION

investigation as to their value and yardage by dredging people and it is eminently probable that other dredging plants of the type now being operated on Kirtley Creek will be installed in this district in the near future.

Kitty Burton Mine—Next in importance as a source of gold in Lemhi County to the Kirtley Creek Dredging enterprise was the lode mining enterprise of the Kitty Burton Mining Company at Ulysses, about 40 miles north of Salmon City. A thousand feet of new development work done on this property during the year has greatly enhanced the value of its ore resources and opened up some much better milling values than were formerly available, and with its extensive reserve of low grade ore this property is now assured of a successful future.

It is equipped with a 15-stamp mill, to which has lately been added a small plant for treatment of the iron sulphide concentrates produced by the mill. This little auxiliary plant has given excellent satisfaction and solved the problem of obtaining the baser values on the ground from the concentrates, which, while of exceilent grade, do not warrant the excessive cost of long wagon haul, railroad shipment and smelting. This enterprise has experienced a number of ups and downs from the loss of its former mill by fire, and from the complicated faulting system with which its ore bodies have been afflicted, and the present stage of its development and operation is a great credit to the energetic ability and the persistency of the manager in charge, Mr. R. L. Edwards.

Mr. Edwards is also developing a new property on Musgrove Creek, in the western part of Lemhi County, which has recently been equipped with a small milling plant that is now in successful operation, using straight cyanide method, and this enterprise gives definite evidence of an interesting new source of gold for Lemhi County, as it has already developed a nice ore reserve of good values and is expected to make an output of $8,000 or $10,000 per month.

Gibbonsville Mines— At Gibbonsville a new incorporation was recently formed embracing a large group of claims on which the old Twin Sisters Mine is the central feature of development.

This property and its adjoining groups have produced considerable good ore in the past and have definite merit from a further development standpoint and the likelihood of proving a paying gold mining venture under careful management.

Some further development was undertaken in this district on the A. D. & M. property by sinking, and at Hughes Creek a mill was built for the operation of the Bull of the Woods Mine.

Shoup Mines—The western part of Lemhi County contains quite a number of attractive gold mining prospects, especially around Shoup, where there are large bodies of developed ore of fair grade in gold awaiting the investment of capital in their further operation. A sale was recently recorded of a flattering showing in a small vein of rich gold ore on Pine Creek to Mr. Arthur Buckbee of Salt Lake City, who expects to equip the property with a mill in the near future.

Blackbird Mines—At the Blackbird Copper District, where is situated some of the biggest copper ore deposits of Lemhi County, some investigations are now in progress looking to a resumption of development. Blackbird is one of the best mineralized copper districts in the State, and, with all kinds of ore deposits, from rich stringers of high grade sulphide mineral to big disseminated sulphide zones up to 150 feet thick carrying average values of two and a half per cent copper, with relatively high values in gold amounting to better than 50 cents per unit of copper value, the day of the further development and more thorough investigation should be now at hand, in view of the great fortunes that are being made at other points in the west from the treatment of one to one and a half per cent ores.

Yellow Jacket Mine—At Yellow Jacket District, a few

miles further west, the old Yellow Jacket Mine has been undergoing further development with a limited crew of men for several years past. This property was equipped with a 60-stamp mill and formed the basis of quite a big operation over 15 years ago, since which time the mill has been idle. The ore formerly treated ran ten or twelve dollars per ton but showed quite a loss in the tailings to the simple amalgamation method of treatment then employed, and a small plant has recently been under consideration for the treatment of several thousand tons of tailings that were saved from the former milling operation by cyaniding, and an effort is being made to finance the property through a stock selling campaign to revive the main milling plant and treat a large reserve of low grade ore that has been developed in the mine.

OWYHEE COUNTY.

The mines of Owyhee County have continued throughout the past year to maintain an important output of gold and silver, and while not as large a yield was made as formerly by reason of the apparent exhaustion of the Trade Dollar Mine and its consequent idleness, the yield of bullion is still considerable, and the new development work in progress at several points is likely to result in the near future of maintaining the reputation of Silver City and tributary districts as a source of profitable mining business indefinitely. The principal source of metal from this county now is from the operation of the Delamar Mine.

Delamar Mine—This old property continues to employ a force of 250 men and produces about 20,000 ounces of bullion per month.

Its vitality is wonderful in view of the past testimony of expert talent which has seen its finish and exhaustion every year for the past ten years, but, in spite of advancing operating cost and other adverse conditions the enterprising and judicious management with which its operations are blessed have been able to adjust the milling processes and make a little margin of profit on the year's operation on continually receding values, besides carrying a necessarily large force on development work in addition to ore extraction, the latter item involving one of the largest costs of ore production to maintain the milling requirements of about 150 tons per day.

The company performed nearly two miles of underground development work during 1912 searching for new ore bodies and endeavoring to solve the geological problems its complicated ore deposits involve.

The company's territory is quite extensive. It has been a large producer during the past 20 years, with an output

LOW GRADE ORE AND WASTE DUMP NO. 4 LEVEL, DE LAMAR MINE

approximating ten million dollars, the predominant value of which was gold.

In the early years of its operation this property was noted for some remarkably rich bonanza ore shoots and made a production of mineral that contained average values of $100.00 per ton as fed into a large mill. At that time the process of treatment employed involved an operating cost of $16.00 per ton, due to high fuel costs and to the expensive chemicals required by the process. The present method of treating the ore is by all slime straight cyaniding methods and without concentration of amalgamation and costs about $2.00 per ton. This has permitted of the remining all the old stope fills that were made during the early operations of the mine, and also large low grade ore dumps are worked in, together with numerous small stringers of ore that were left in the early-day operations, and also large virgin bands of low grade mineral are also utilizd, that were left as valueless by the earlier operators of the property.

An important production has also been made from the Sommercamp side of the property, on the opposite slope of the mountain from Delamar, and some good ore has been found as low as the twelfth level in the old ore channels.

The bonanza values of this property in its upper level terminated at a pronounced fault called an iron dike, which consists of a wide, soft, blue, leathery talc, richly impregnated with iron sulphide. It is not a settled fact from the nature of this fault whether it is of later or earlier date than the ore deposits. If it should prove of later date than the ore formation, which is not unlikely, there still remains the chance of recovering the faulted end of the famous old bonanza stopes and the re-establishment of the property in all its former glory as a high grade ore producer and dividend payer.

Considerable work is being done by the present management on the opposite side of this great fault for the pur-

pose of determining the extent of its displacement and the virtue of the geological theory involved.

The property is owned by a conservative and responsible English company, but the cream of the deposits were gone before the property came into their possession and their investment has not paid 2 per cent interest, in spite of the large aggregate amount of bullion they have produced, and in its present condition, with the low grade values available, the property is run largely for the benefit of the labor community that depend upon it for a living, as it is nip and tuck with the management to make a profit on the operation with the ore values now available.

The sole producion of this company is the money metal of the country, and it is inconceivable how an intelligent Government should harass such an enterprise as this the way our Federal authorities have in their efforts to recover at an unjust retail price claim for timber that the company has used and paid for during its extensive period of operation. Such a claim is morally if not legally outlawed and never had any real virtue in fact, for when this enterprise was started American mining law was liberally administered and local rules and customs of the district were one of its chief features. It was then, and has been since, until recently, the local practice of all western mining districts to use such material as was absolutely necessary for their operation as the adjacent Government lands afforded, which were bought and paid for in this instance at excessively high rates from local wood rustlers, who furnished it at so much per cord or running foot.

This company has been further embarrassed during the past year by an effort of the Federal Interior Department, through a special agent, by injunction proceedings in the Federal court, to stop it from cutting or purchasing timber from the desert mountain sections of the township in which their property is situated, claiming that it was nonmineral land, while as a matter of fact and record, the township in which this property is situated, from the op-

TWENTY THOUSAND OUNCES PRECIOUS BULLION,
MONTHLY CLEANUP, DE LAMAR MINE

SWELLING GROUND, DE LAMAR

eration of this and other mines has produced $30,000,000 worth of gold and silver in the past 20 years, and practically all the timber of lumber value which it ever possessed, which was very scrubby at best, was removed by the operation of the adjacent War Eagle Mountain District prior to 20 years ago, or between 1860 and 1890.

The isolation of the Delamar Mine is such, over a very road, as to make the cost for fuel hauled from the railroad almost prohibitive, and for its rough requirements of mine lagging and cordwood, the latter largely used by the miners and their families with which to cook their meals, the local desert mountain slopes' growths of mahogany, juniper and other desert brush wood has been drawn upon for their essential requirements. This kind of timber has absolutely no value as a conservator of snow, or for lumber of future forest purposes. It is has been purchased by this company for the use of its employes at from $10.00 to $14.00 per cord, and is largely packed on mule back from the steep mountain slopes to points of access by wagon by Italians and others, who make a business of supplying this class of fuel to this company and other residents of the district.

If the Government succeeds in this unjust persecution of a legitimate money producing enterprise it will put this company definitely out of business, and the soft, swelling nature of the ground in which its extensive operations are carried on is such as would close together in a few years and would be forever lost as a source of gold, as it would hardly be likely that anybody would ever again undertake to reopen its present extensive old levels to follow out the interesting geological problems the deposits present, which in its present stage of operation, besides making an appreciable tribute to the real money supply of the country, still contains the strong probability of the recovery of its faulted virgin ore bodies and a very large increased output of the most desirable metal for which mining operations are followed.

Flint Mines—Next in importance to the Delamar operations in this section is the new development enterprise at Flint, a short distance southeast of Delamar on the border of the same township.

At this point another English company, known as the Flint Mines, Limited, have been actively developing an extensive group of claims throughout the year, covering a pronounced series of quartz filled fissures varying from a few inches up to 14 feet in thickness. These are old properties, and one of them, under the name of the Perseverance Mining Company, a precedent ownership, having been quite extensively developed through a shaft 500 feet deep and several levels.

This particular feature of the property carries a vein seven feet wide with a paystreak 4 feet wide containing average assay values from $25.00 to $30.00 per ton, with quite an important reserve of this grade of ore blocked out.

The prevailing values in this ore are silver, but there is also an appreciable amount of gold.

This particular property was originally owned by some of the Bonanza kings of Comstock fame, and during the early Comstock days two of these old Comstock operators personally wintered on this property.

The ore values are asosciated with grey copper and some antimony minerals and were difficult to treat at such a remote district, 200 miles from the railroad transportation at that time, which acounts for the lack of bullion output from this enterprise and the fact of its ore resources remaining intact to the present day.

Since this property and a number of adjacnt claims were purchased by the present company at a total cost of $135,000 a conservative plan of development has been under progress, which has inclined the extension of 1,500 feet cros-cut tunnel, which taps the shaft development on the main vein. This work has been done by hand, and in the meantime extensive investigations have been made through

large shipments of the working average of the ore resources for the purpose of determining the most feasible method of extracting the values, and it is believed that one of the modern processes has been adapted to the successful handling of this ore, and a reconstruction of the old milling plant with new machinery and appliances, including a 40 stamp battery for crushing, is planned for additional equipment of the property next summer.

During the past season, several new camp buildings were erected and a power line was extended from the Rich Gulch terminal of the Idaho-Oregon Electric Power Company, and a large electric driven air compressor installed, together with the necessary motors and a brick transformer-house, and the camp was also connected by telephone with the Silver City lines, its water supply rebuilt, and many other improvements made, and the enterprise is now in shape to prosecute the further development of the property in an active manner.

This feature of the enterprise is under the direction of the well known enginering firm of Bainbridge, Seymour & Company of London, England. Mr. Arthur Courtney is General Manager and Mr. J. M. Morgan, the resident mine manager, and the company's agent in Idaho. At present there is a force of 25 men employed at the mine, which will be largely increased as development progresses, as the plans in this respect involve the immediate sinking of the main shaft from the tunnel level an additional 500 feet and a full exploration of the ore channels at that depth.

There is definite evidence from preliminary surface work of a number of distinct and important ore shoots on the property. It is well financed and in the hands of capable up-to-date operators, and there seems no reason to doubt the ultimate success of the venture as a profitafle gold and silver mining enterprise of considerable capacity.

The formation in which these ore bodies occur is an eruptive granite, and several of the veins are accompanied

with intrusive dikes and show a close comparison in the nature of their origin and formation with the famous Trade Dollar Mine nearby, that has produced $20,000,000 at a net profit of $10,000,000.

Rich Gulch Mine.—The Rich Gulch Mining Company, a Utah corporation, whose property is situated on the west slope of Florida Mountain, between Flint and Silver City, has continued under steady operation throughout the year and has about completed the erection of a substantial mill of 100 tons daily capacity.

This property has considerable shallow surface development work, is situated near the head of Rich Gulch, and its deposits evidently formed one of the principal sources of the placer values that have been mined in that tributary. The main deposit on the property is a fissured zone in a thin structured basic igneous rock that is highly silicified. It contains well marked wall gouges and fairly well defined courses of ore along these walls.

This zone is fully 50 feet thick, and underground it resembles the famous 77-foot vein of the Delamar Mine. At the surface it is covered with debris consisting, below the line of its apex, of disintegrated lode material that shows handsome pannings in free gold for a considerable width, indicating definite underlying ore shoots. This, together with some shallow tunnel work on another ore shoot, seemed to warrant the extensive development of the deposits through a long cross-cut tunnel, which has been driven in from a convenient point lower down the gulch, a distance of 3,000 feet, where it has intersected the main vein of the property at a convenient point for drifting between the two main ore shoots, and undercut it at a vertical depth under the highest ore shoot of nearly 1,000 feet.

This property is equipped with an electric driven air compressor and a number of convenient camp buildings and has been a well handled piece of mine development work. There has been several hundred feet of drifting done since the vein was cut.

The company maintains an assay office on the ground and carefully samples the work as it progresses, occasionally obtaining some very high values, but the management is conservative in its estimates of its ore resources and is figuring them on an average basis of $8.00 to $10.00 per ton in gold.

The south drift from the main cross-cut has been extended 200 feet and has already passed through a handsome looking shoot of ore 4 feet wide that is said to maintain these values, while the north drift is being pushed out and will undercut the shallow tunnel work on the north ore body at a depth of 600 feet. In this drift the values are also said to average $10.00, and when a connection will have been made through to the old works, and the new milling plant fully completed, the enterprise should be in shape to anticipate some important mining profits by the successful treatment of these ore values.

Florida Mountain Mines—Between the Rich Gulch property and the Trade Dollar Mine near by, the Ontario group of claims, owned by Sullivan & Matterson, was operated during the year by a small force of men on a leading basis. This group carries some small shoots of a very rich ore. It shipped 30 tons of ore in 1911 that yielded smelting returns of $9,000, and a similar amount in 1912 that was milled at Silver City and gave a return of nearly $200.00 per ton in free gold.

This property has recently been sold to a new company and a substantial payment made on the purchase price. The new owners are sinking a winze on the main ore shoot to determine its extent at further depth with a view of ultimately tapping the deposit by cross-cut tunnel driven in from the very steep mountain slope on which it occurs.

The small rich ore shoots are accompanied by a large zone of highly altered rhyolite formation very pronouncedly fissured and said to carry low values throughout a very considerable width, and it is believed this deposit can be trated by modern cyanide method on a large scale.

Similar conditions prevail in several adjacent properties, and it is also believed by people conversant with the extensive upper horizons of the now idle Trade Dollar Mine that large tonnage of old fills and trimmings remain on that property that can be handled at a profit by modern cyanide methods, and there was current a report in the district involving the transfer of the Trade Dollar to new owners with a view of utilizing this resource of low grade ore.

At Long Gulch, on the south end of Florida Mountain, near Silver City, the Banner Mining Company was working a force of 15 men on development and had a nice reserve of milling ore in sight above the 200-foot level and a similar shoot on the 400-foot level.

These ore shoots, it was believed by the management, would give milling results of about $20.00 per ton.

The Banner group is well equipped with a splendid new milling plant and has considerable development. It embraces a very pronounced fissure vein that parallels the Trade Dollar vein a short distance to the west. All its development to date, however, is in the overlying basalt formation of Florida Mountain, and in no place has it so far penetrated the underlying granite which was so productive in the adjacent mine.

The nature of this vein has not been fully appreciated in the past operations and the development has been largely confined to one wall. The principal ore shoot that has been found has produced some wonderfully rich specimen gold and silver ore and it is believed that the deposit is a wide fissured zone similar to that of the Rich Gulch property, and similar to some of the Delamar veins, rather than a narrow fissure like the Trade Dollar.

This enterprise is suffering for a lack of capital for its more complete development, which is well warranted by its surface manifestations at different points along its strike and its close association with the neighboring bonanza.

The further extension of its drifts to the north along the vein, especially from the 400-foot level, with a view of getting further under the main mountain and into the underlying granite formation, would be likely to bring results in buried ore shoots of commecial importance and probably bonanza values.

Systematic cross-cutting should be done in this drifting work so as not to overlook any parallel shoots, for it is a notable fact that its famous neighbor had a very closely paralleled system of ore channels that were alternately productive of rich ore.

Florida Mountain is a peculiar geological example of dome shaped uplift of eruptive granite, which has subsequently been intruded by dikes of basalt and rhyolite. Each of these intrusions have produced an immense overflow of its characteristic lavas, producing immense mushroom-shaped caps of this basic and acidic igneous rocks over the granite. The whole series was subsequently fissured on the line of the original intrusive basalt dike and mineralized by hot ascending solutions carrying gold and silver.

The values in the Trade Dollar show a marked variation in the formations that the fissure traverses, and until the lower granite formation is penetrated by the Banner workings it will always remain a splendid development chance that should be fully investigated.

Immediately adjoining the town of Silver City, at the mouth of Long Gulch, the Silver City Mining and Milling Company have continued the extension of their long crosscut tunnel through an interesting group of claims adjoining the Trade Dollar property to the east and embracing a strong branch fissure to the Main Trade Dollar vein, which makes a very attractive showing at the surface and is likely to contain some of the high values for which the Trade Dollar was noted, when it is encountered in the new tunnel and drifted upon.

This new tunnel will tap the main ore course of the property at approximately 800 feet in depth below the croppings.

There are several other veins on the group that will be penetrated by the tunnel and opened for further convenient exploration by drifting, and the enterprise is a mine development venture that well warrants its cost from the favorable situation and surface showings that the property makes.

War Eagle Mines—On War Eagle Mountain, east of Silver City, several small mining operations were in progress by owners and lessees. Among these the Ruth Mine, owned by Mr. George Wstlake, made a production of rich milling ore, a shipment of which was made to the Addie Mill and treated with profitable results.

The Owyhee range, extending southeast from Silver City to Castle Creek and northwest to Cow Creek, and on all the tributaries of both its slopes throughout its length embraces an extensive area of the favorable ore bearing formations associated with the Silver City deposits, whose total production to date, since discovery, exceeds $50,000,000, and this territory today presents a most attractive field for the prospector and investor by reason of its many interesting showings of high and low grade ores.

South Mountain Mines.—South of Silver City, 20 miles nearer the southwest corner of Owyhee County, the South Mountain Mines were idle throughout the year except the necessary assessment work where claims have not obtained patent.

At this point some remarkably flattering ore deposits exist that promise immense tonnage of profitable mineral when more fully developed.

South Mountain is an ellipitical shaped uplift in a lava plateau region. It is over 10 miles long and 5 miles broad and consists essentially of eruptive grano-diorite. Traversing its central axis is a pronounced zone of sharply folded

THE GOLCONDA, OLDEST LEAD MINE IN IDAHO, OWYHEE COUNTY

sheered and schisted limestone that has been reduced to marble and carries on the property of the South Mountain Mining Company a remarkable surface manifestation of underlying ore bodies in the form of immense brown, spongy iron gossan croppings, associated with metamorphic minerals, together with zinc, lead and copper oxides. These gossans are in places 50 feet thick. The property was originally operated as a lead-silver deposit and has the credit of supplying the primary lead-silver smelting enterprise in Idaho, as it was equipped with a small lead stack as far back as 1873, at which time the district attracted a great deal of attention and was the scene of a boom mining excitement. Several hundred thousand dollars' worth of rich silver bearing lead bullion was run out from these ores, at a comparatiively shallow depth, however, the high grade lead carbonate ores were replaced with sulphide mixtures with zinc and copper iron sulphides which resisted treatment by the crude metallurgical methods of that day.

A tunnel has been extended in towards the main ore showing over 1,000 feet but still lacks a little of undercutting the best surface evidences of the deposit. If extended 2,000 feet farther, it would gain a maximum face depth of 800 feet and average about 500 feet all the way and should be in the most productive zone of the deposit the entire distance.

The grossan croppings along this great mineral zone are generally associated with green copper carbonate, from which selected samples show high values in both copper, gold and silver, and at one point on the surface shaft has been sunk 50 feet deep, which discloses a well defined paystreak of copper iron sulphide ore in a silicious gangue, richly impregnated with iron carbonate and calcite crystals that average about 10 per cent copper, 30 ounces silver, and $1.50 gold per ton.

This is a very interesting development in connection

with such extensive gossan croppings, indicating big reserves of similar mineral that would afford an ideal ore for treatment in a reverbatory furnace with cordwood fuel (like the old method employed at Butte in its early days), from which a very rich gold and silver bearing copper matt could be produced that ought to stand transportation charges during the favorable weather periods of the year to the railroad under present conditions.

This copper sulphide ore carries occasional kidneys of clean galena containing very high values in silver up to several hundred ounces per ton that could be hand sorted out a separate shipping product. Accompanying this relatively high grade copper sulphide ore, which promises to be the prevailing mineral of the property at further depth, there is a pronounced streak of coarse grained zinc sulphide that carries very little gold or silver that could readily be concentrated to a high grade shipping product that would prove highly profitable if railroad transportation was more convenient to the property.

There is some talk and prospect of the construction of a railroad from the Snake River Valley to the Western or Central Pacific at Winnemucca, Nevada, passing along the base of South Mountain.

The construction of this line would give easy access to these deposits, and doubtless result in their extensive operation, and the establishment of a large and profitable smelting ore mining enterprise at this point.

The smelting ores of this district are invariably rich in associated gold and silver values, and, while the silver values predominate, occasional assays are encountered that run up several hundred dollars per ton in gold.

The peculiar pseudomorphic quartz gangue so characteristic of the rich gold-silver ore association of the De-Lamar mine were originally crystals of barite, calcite and other minerals, which have been completely replaced by silica and indicate a mineralogical relationship between

the DeLamar and the South Mountain ores, as these crystal gangue minerals are richly manifested in their original unaltered form in the South Mountain deposits, together with some sandy garnet and epidote rock, and other rare contact metamorphic mineral forms.

The South Mountain deposits, while at a serious disadvantage from a railroad transportation standpoint, being about 100 miles distant over the best wagon road route at present, nevertheless contain the elements of a successful and productive mining district of desirable smelting ores and are likely to some time be recognized and become an important factor in the mineral industry of Owyhee County.

SHOSHONE COUNTY.

Shoshone County still continues to be the banner county of the State in the matter of mineral production and enjoyed a very prosperous year during 1912, employing a large force of men in its producing mines and making a larger yield of mineral and a bigger metal output than ever before in its remarkable history of 27 years' continuous production. In spite of the pessimistic views of exhaustion, based on a theory of its ore genesis, and expressed by mining men of high talent, with which this famous district, in common with other great mining districts, has been haunted for several years, it continues to expand in general ore resources, and from new bodies of ore found during the past two years and developed into large producing properties, it is not an exaggeration to say that the future of the district never was so bright as a further probable source of ore at any period of its history as it is today. The new discoveries recently made discredits the often expressed opinion that all its important ore channels have already been discovered.

Every division of the district, including Wardner-Kellog, Mullan and Burke, has recorded new ore developments during the year of commercial importance and in places of considerable magnitude, while the Nine Mile District, in the edge of the discredited Pritchard slate formation, has two new properties with ore resources and milling equipment that, when combined, will rank with some of the producers of the first magnitude and promises to last indefinitely as a source of mining profit.

Federal Mines—Two of the most famous producers of this district during the past ten years, which, by the way, have been worked to the limit all the time, are nearly exhausted. These are both Federal Mining Company's

properties and include the Last Chance Mine, near Wardner, and the Standard Mammoth Mines at Mace.

The former mine exhaustion is due to litigation cutting of its extralateral rights in depth and the latter is due to the pitch or rake of the ore body in the plane of the vein entirely through this company's territory into adjacent ground to the west. The latter, however, has been purchased by the Federal Company and the operation from now on will be continued through the splendid equipment of the Mace Mines, while the famous Last Chance Mine has been traded off through a litigation settlement for a good slice of the stock of the Bunker Hill & Sullivan bonanza.

The Last Chance Mine has been worked down to the Kellogg level, about 2,000 feet below its apex, and has proved one of the most productive pieces of lead-silver bearing territory ever developed in mining history for its length. It is now being worked from the Kellogg level back to the surface, and the bulk of its present ore tonnage amounts to a thousand tons a day now comes from its upper horizons very near the grass roots of the deposit above the old Last Chance No. 2 tunnel, and consists of low grade ore bodies that were passed up by the early operations and are now made to yield a decent margin of profit and very aptly illustrates the progress of metallurgy and mining methods in the past 20 years.

At Mace, the Standard Mammoth ore body ofthe Federal Company, one of the richest and most profitable single ore channels in the Coeur d'Alenes, has drifted in its rake to the west entirely through the length of the Standard Mammoth claims and has been followed for several hundred feet into the adjoining Cleveland-Green Hill group, where it has been opened up with several levels and is now being successfully mined at a vertical depth approaching 4,000 feet under the Custer Mountain spur, through the 2,200 foot vertical shaft, whose collar is in

the Campbell tunnel at Mace, 1,300 feet below the apex of the vein.

The Morning Mine of this company still continues to develop in a very satisfactory manner from a standpoint of ore tonnage, but the refractory nature of the ore has not improved, with the exception of some encouragement at the east end.

During the middle of the year this great mining institution seemed to be feeling the effect of a weak development policy and consistent reaching out after new ore sources. At the close of the year, however, current report indicates its early acquisition of some of the choicest developed ore resources of the district and its continued dominance in this field indefinitely.

This company employs a large army of men and has one of the most efficient local staffs in both its mining, mechanical and metallurgical departments of any mining company in the United States, which is a big capital asset of itself.

This mining organization has been perfected by Mr. W. Clayton Miller, who, after a number of years' service with this company, resigned during the summer, and his place was taken by Mr. Harry L. Day, former owner-manager of the famous Hercules Mine, a local product, and at the same time one of the most capable and efficient organizers and operators in the district, and the further destinies of the enterprise in this respect are in exceptionally good hands.

It is reported that this company has recently purchased the property of the Star Mining Company, which has a large developed ore body immediately west of and in the strike of the Morning vein, from whose main levels it can be developed and mined to most excellent advantage, and whose added ore resources to the big reserve in the Morning Mine itself will extend the life of this magnificent unit of the company's holdings for a long period of years. This company is also credited with extending its hold-

ings still farther west, and also of considering the acquisition of other well known territory, and has taken a tumble in opposition to the views of its higher technical talent regarding the early ore exhaustion of the Couer d'Alenes, which, as a field for lead-silver mining investment, involving and warranting big capital risk, has proven by actual experience and ore results to date to be without a peer in the whole mining world, and as a blanket venture I believe that all the recognized favorable ore bearing territory of the district will warrant its cost on any rational basis of valuation for the present known and unknown ore bodies it contains.

Bunker Hill & Sullivan Mines—The Bunker Hill & Sullivan property at Kellogg continues to be the largest producer of the most profitable single mining enterprise in the Couer d'Alenes, and with a slight interruption of a few days, due to the serious underground fire it experienced, which, however, by reason of excellent preparation for such emergencies was quickly gotten under control, this company has continued its steady ore production throughout the year, operating its new modern concentrating mill with a capacity of about 40,000 tons of ore per month while the old mill is being remodeled and put in shape for future use.

Extensive underground improvements are being made at this property of such a substantial nature as to be only warranted by eminent evidence of long life as a big source of good concentrating ore.

Its ore resources show no diminution in value or volume in spite of the great depth at which they are mined, and their geological situation presents no prospects of their interruption to a further indefinite depth and this property is likely to continue for some time to be the premier lead-silver deposit of the world.

This extensve operation employs a force of 600 men all told and yields 40,000 tons of ore per month that affords a

margin of profit for dividend purposes of about $1.62 per ton of ore mined, which amount to splendid annual dividends in the aggregate. This comparatively narrow margin of profit per ton, however, would be seriously affected by any material drop in present metal prices, due to tariff agitation, or increased mining costs, which must naturally accrue in following its ore channels to such great depth as further development will involve.

The rich silver-lead copper ore development of the Caledonian Mine, adjoining the Bunker Hill & Sullivan, was suspended and shut down during the early part of the season through apex litigation and has since remained idle pending the trial of the suit.

Stewart Mine—The Stewart Mine, adjoining the Bunker Hill & Sullivan territory to the west, has enjoyed a remarkably successful and continued output of rich concentrating mineral through its new adit tunnel, driven into the ore bodies from Deadwood Gulch. This operation has maintined an output of over 500 tons of rich concentrating ore per day, equal in lead values to any in the district and above its average in silver. The deposit has proven a revelation to its owners in this lower horizon as compared with its upper levels, through which it was formerly worked.

Ontario Mine—Adjoining the Stewart Mine to the south, the Ontario Mine has successfully developed a valuable ore shoot through the Silver King tunnel from Government Gulch, which has supplied a daily output of over 100 tons of rich concentrating ore throughout the year, which is treated in the Silver King mill.

These deposits embrace some remarkably interesting geological conditions, but as they are now involved in an unfortunate apex litigation controversy, and as these features will be very elaborately worked out and published through the testimony of some of the most expert witnesses in the world in current court proceedings, I feel a delicacy in touching upon them at this time.

Our abortive Federal Apex Law has been the cause of more grevious hard feelings and expensive litigation and interruption of the mining industry in the Couer d'Alenes than any other single cause, and every mining man should get busy and urge the revision of this and other silly mining statutes by which our mineral industry is now embarrassed for the benefit of future locations and ore discoveries.

Marsh Mine—At Burke the notable development progress of the year has been a marked improvement of the interesting ore channel now being opened by the Marsh Mining Company east of the Tiger-Poorman.

This interesting ore body has now been followed through an incline shaft, sunk from a cross-cut tunnel driven in from the gulch to a further vertical depth of 400 feet, and has shown a marked expansion in both width and length as the development has progressed downward.

It now has an ore body over 300 feet long with a maximum width of 10 feet of excellent milling grade that made an output during the year of 60 cars of mineral containing nearly three million pounds of lead and ninety-one thousand ounces of silver and one hundred ounces of gold.

This ore is hauled from Burke to the Pittsburg Company mill on Nine Mile for treatment. The Marsh Company is now pushing a new scheme of development, involving the raising and sinking of a vertical shaft from the lower level for the purpose of a more convenient method of developing and handling the manifestly important ore resources that the property contains.

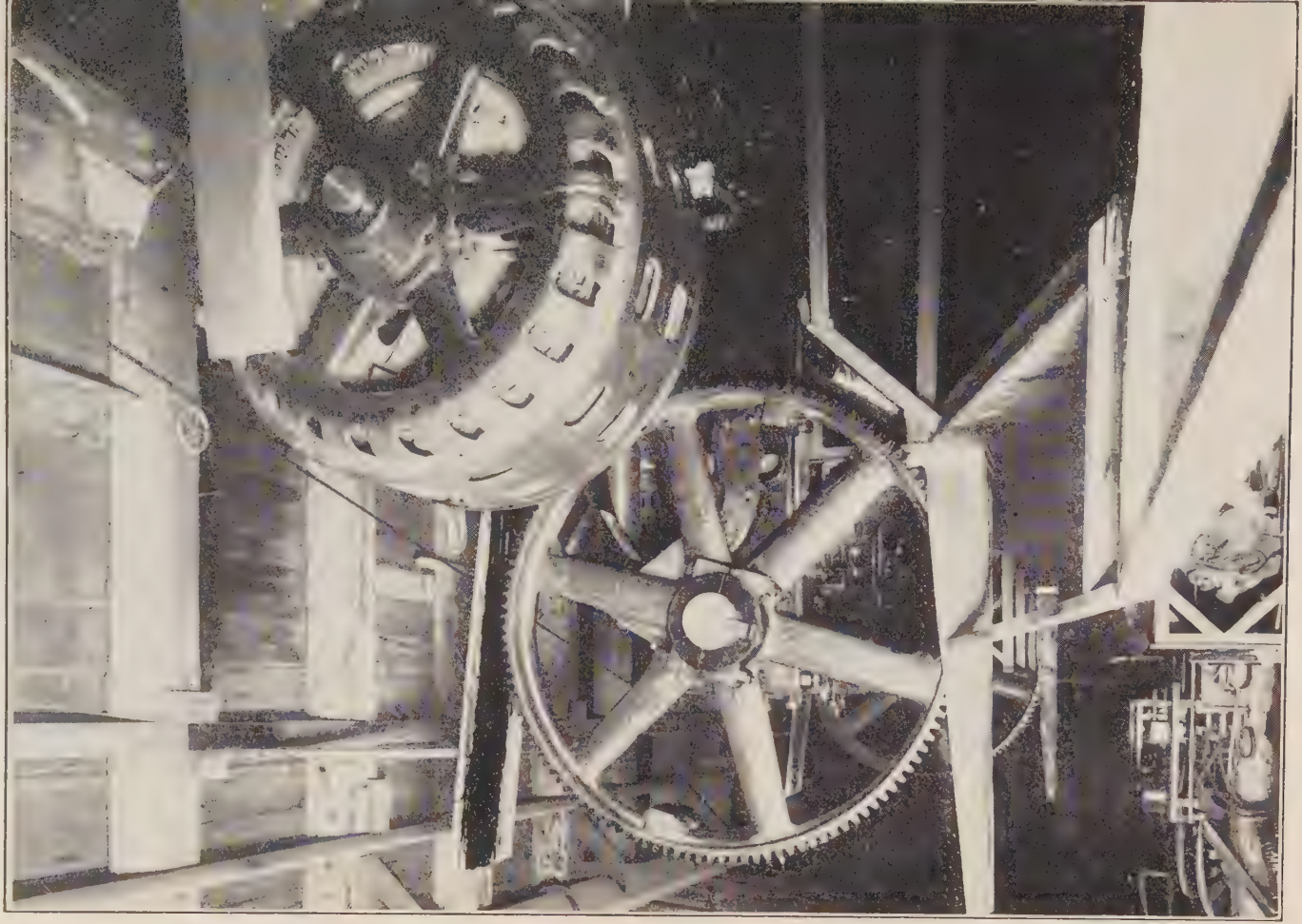
Hecla Mine—At the Hecla Mine the management maintained its normal steady output and production of mineral throughout the year, and finished sinking the main shaft from the 1,200 foot level to the 1,600 foot level, where a great station has been cut out and drifting commenced on the course of the vein towards the ore channel.

Fear was formerly experienced that as development progressed in depth on this property that the nearby Tiger-Poorman Mine, which has been abandoned and now forms a water reservoir approximately 2,200 feet deep and 1,000 feet long, by the thickness of the unfilled ore spaces would cause the Hecla considerable grief and expense in pumping, but this fear has been by no means realized as the Hecla has not shown any abnormal increase in water flow as development has progressed, and to forestall any such emergency the management has provided one of the largest and most improved pumping plants ever installed in the district.

This plant is situated at the 1,200 foot level, and the other main water sources in the mine are conveyed to it by means of syphons.

This pumping equipment consists of duplicate 6 in. by 12 in. Aldrich vertical quintuplex electric driven pumps of the pot chamber design. The combined capacity of these pumps are 800 gallons per minute, but either pump is capable of handling the water flow so far experienced in the mine at any season of the year. Each pump is geared through a flexible coupling to 175 horse power 2,300 volt Westinghouse Induction Motor of the Squirrel Cage type. The pumps are connected to an 8 inch column pipe through check valves and are equipped with 3 inch by-pass valves to relieve the pressure in starting. A float switch is installed in the sump so as to ring an alarm bell when the sump is full or empty. In addition the pumps are automatically stopped when the sump is empty by the action of the float switch on no voltage release installed in the starting boxes.

These pumps have been operated nearly three years and have given excellent satisfaction. They are compact in construction, involving comparatively little floor space, and resemble two massive five stamp batteries with the frame cut off at the cam shaft line, and will doubtless



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prove amply able to take care of any water flow that the further development of the mine is likely to involve.

The Hecla Mining Company owns quite an extensive group of claims, reaching back on to the high mountain slopes east of the town of Burke for a considerable distance.

This territory has been undergoing systematic exploration with a limited force of men continuously for several years past for the purpose of determining its merits as a possible source of additional ore reserves east of the main deposit on which the enterprise is based.

This sensible and systematic method of making hay while the sun shines has finally rewarded the management with a new ore channel that has been discovered at some distance east of the main shaft workings by extending an old adit tunnel driven into the original ore body from the Canyon Creek level in the town of Burke.

This new ore channel is cut at a depth under the surface of the mountain in which it occurs of something like 1,700 feet, and though small where encountered it contains the characteristic condition of fissuring clean galena and silver values of the other notable channels of this part of the district, and, in view of the fact that it is well within the prolific ore bearing Burke quartzite area, justifies the hope that it may prove of commercial size and importance when more fully developed and possibly prove a second ore channel of the old Hecla type, which would be a gratifying reward for the steady campaign of development on the property in this direction which the management has consistently prosecuted for several years.

Hercules Mine—The Hercules Mine has continued in steady operation throughout the year with full force, including about 287 men all told, with a slightly increased output of its characteristically rich concentrating ore.

The new No. 5 tunnel of this enterprise, starting from near the Canyon Creek level in Burke is proving a slower undertaking than anticipated, by reason of the extremely

hard rock being encountered, which, in spite of the finest equipment and unlimited power resources, refuses to advance in excess of 200 feet a month and eats up dynamite, drill steel and compressed air in a very costly manner.

This is a very expensive line of development, involving a drive of practically two miles before the ore bodies will be finally undercut.

The tunnel is now in 4,000 feet and has approximately 4,000 feet more to run before encountering the vein at a depth of 700 feet below the present lowest workings, and will give an idea of the big capital risk in mining development this district demands, but the strength of this famous ore body in the present lowest tunnel is such as to leave little concern as to the ultimate outcome of this undertaking, unless it be from a metalurgical standpoint; but before it is completed the ore channel will doubtless have to be drawn upon by sinking from the No. 4 tunnel level, which is now at a depth of 1,800 feet on the dip of the ore body below its apex.

Ajax Mine—In the same gulch with the Hercules upper workings there are two other promising enterprises in progress. The Ajax Mine, on a parallel vein 1,000 feet north of the Hercules vein, has tapped its fissure through the old Moonlight tunnel, which has been driven in a total distance of 2,361 feet.

Where this tunnel encountered the vein it was found disturbed by a dike 18 feet wide, but this disturbance is passed and a well marked fissure is now being drifted upon to the west, showing quartz and low grade concentrating ore containing a mixture of lead, zinc and iron sulphides that have expanded in places up to as much as 4 feet wide, and the management has strong hopes of encountering the ore shoot that was disclosed in an upper tunnel on its rake to the west by a further extension of the drift. A drift has also been extended to the east of the cross-cut on the vein and some good patches of mineral encountered in that direction in more or less disturbed condition. An

excessive flow of water has been encountered in this work which has greatly retarded the progress, but local confidence is still expressed in the ultimate profitable outcome of the enterprise.

Moonlight Mine—Further down Gorge Gulch, and on the strike of the Hercules vein to the east, the Moonlight Company are extending a long tunnel to tap the big vein it developed in its upper works at several hundred feet further depth.

Ths cross-cut is now closely approaching the vein and will give a splendid chance to explore its ore bearing possibilities during the coming season by drifting.

MULLAN DISTRICT.

The mines around Mullan, aside from the prospective acquisition of the Star property by the Federal Company, experienced a year of successful and important ore development that warrants the anticipation of a material expansion of ore production and mining business for this center in the very near future

With the further extensive development of established ore resources of the Star undertaken by the Federal Company through the main levels of the Morning Mine, it will increase the business and tonnage capacity of that magnifii cent mining and milling plant and will probably permit of an ore mixture and milling advantage that will help to solve the present difficult metallurgical problem of the Morning ore and admit of an increased saving of values.

Gold Hnter Mine—The other most important mine of the Mullan District is the Gold Hunter, whose ore deposits are geologically higher than those of any other important lead-silver producer in the whole Couer d'Alene series, and by virtue of this condition its permanancy and expansion in depth as the more favorable metal bearing wall rocks are penetrated has been repeatedly predicted in my previous

annual reports, and it is gratifying to be able to chronicle the apparent consummation of this prophecy.

The past year's development at the Gold Hunter has made such a marked improvement in the quality and size of its principal ore channels as to lift the property out of the doubtful class of probable lead-silver ore resources and to place it in a most gratifying position for the anticipation of a largely increased tonnage resource of much more desirable ore than it has had formerly available.

Its ore bodies now show masses of medium coarse-grained friable galena that has characterized the middle horizons of some of the most famous ore deposits in the Couer d'Alene District, and while some of them carry an excess of sulphide associated with crumbly galena and splotches of grey copper. This iron mineral, unlike that of the Morning, is in coarse crystals, similar to the galena and readily separated by concentration, affording a separate low grade shipping product itself that pays a nice margin over freight and treatment cost.

As a matter of fact, this mine carries a wide zone of mineralization that has not been half tested out even at the No. 6 tunnel level. Its ore bodies are characterized by overlapping or roughly parallel pipe shaped shoots through a zone of country 200 feet thick, and in some respects resemble the irregular ore mass occurrences of the Wardner lode, with the exception that the ore channels are nearly vertical.

The walls are tight and especially adapted for economical ore extraction, and if given the advantage of an efficient up-to-date management there is every prospect that the Hunter would develop one of the most important tonnage resources of profitable lead-silver concentrating ore in the whole district.

A short distance below Mullan, the Alice Mine was opened during the year and made a number of carload shipments of clean high-grade lead-silver concentrates.

MODERN STEAM HEATED MINER'S BOARDING HOUSE, CAPACITY 350 MEN, INDIVIDUAL ROOMS, SNOWSTORM MINE

This deposit occurs in a zone of intensely crushed quartzite formation due to the Osborne fault disturbance and very much resembles in this respect the conditions surrounding the Stewart and Ontario ore bodies below Kellogg.

The Alice produces very clean mineral and its further exploration and development may result in finding a profitable ore channel, as was experienced at the Stewart Mine.

Adjoining the Alice to the West, the Mayflower and Hector Groups are being developed through a long crosscut tunnel in favorable ore bearing ground with some very nice showings of mineral already cut on the Mayflower ground.

Snowstorm Mine—At Larsen the Snowstorm Mine enjoyed a prosperous year of production, new development and equipment, and under the present management its affairs have been pushed in a true and energetic Greenough manner that have characterized its past history.

A lot of money has been spent in transforming the old leaching plant to an up-to-date concentrating mill of 225 tons maximum daily capacity, and while this work has involved a considerable outlay of money, every feature of the old mill that could be used has been taken advantage of. The water line has been rebuilt and put in excellent shape for permanent service, and the remaining ore resources of the mine, both oxidized and sulphide, are being transformed into profit in the most economical manner possible.

The concentrating process has taken a good deal of experimenting and adjustment but is now believed to be brought up to as high a degree of efficiency as is possible on such finely disseminated soft sulphide mineral in such a hard gangue, and the recovery now being made compares favorably with the best results on similar ores anywhere in the world.

While the output of this mine the past year is not as large as its former record, it does not fall far short of it and will exceed the average annual production since shipments first commenced, while the mine still contains large reserves of mineral that can be profitably handled under present metal prices.

Development work has continued at the fourth level, and a raise has been made from No. 4 to No. 3, connecting with a winze from No. 3, which discloses a downward extension of the main ore body to a considerable distance below No. 3, through which it is expected a profitable tonnage of milling ore will be derived. Preparations are now being made to sink from No. 4 in the main vein between the two faults that have interrupted the mineralization for the purpose of determining the virtue of eminent geological opinion in regard to the occurrence of the main ore channel at further depth.

National Mine—By far the most important strike of new ore made in the Mullan District last year was the intersection of a large ore shoot in the property of the National Mining Company at Deadman Gulch, between Mullan and Larsen, on the some vein and about one and one-half miles distant west of the Snowstorm Mine.

This property was formerly operated through an adit tunnel and a vertical shaft 400 feet deep, starting from the outcrop, but beyond finding a pronounced fissure and decided faulted condition and some scattered ore, the original development on this property did not bring any results, and with the temporary failure of the Snowstorm at the No. 4 level presented a rather indefinite prospect of the further merits of this property at further depth, but largely due to the persistent efforts and intuitive scent for ore displayed by Mr. Charles McKinnis, the manager of the National Mine, a campaign of deep developent has been carried on for the past three years through a long crosscut tunnel driven in through the mountain from Deadman

Gulch. This work has been financed by repeated assessments on the capital stock of the company. It consists of a good sized working tunnel that is now 4,380 feet long, and taps the vein at a depth of 1,700 feet under the apex at the point of intersection.

This tunnel was driven through some of the hardest formation ever experienced by tunnel work in the Couer d'Alene District, consisting of tight Wallace slates and St. Regis quartzite that necessitated the use of 80 per cent powder to break the face through some of the tougher ribs encountered.

The formation fault separating the St. Regis quartzite from the more favorable Revett quartzite, which carries the copper ores of this part of the district, was encountered in this tunnel in close fidelity in its relation to the fissure, as shown in the old upper workings.

Where the fault was cut in the long lower tunnel a disturbed zone in the formation contains some scattering lead and copper mineralization, but not in commercial quantities. The main vein was barren where penetrated by the cross-cut, and a northeast spur fracture was drifted upon from the tunnel which intercepted the vein a short distance east of the cross-cut where it was found to be a perfect quartz fiilled fissure from one foot to three feet wide, carrying a decided gouge and heavy flow of water and fulfilling the ideal requirements for a perfect space filled quartz vein more completely than any other fissure development ever encountered in the Couer d'Alene District.

This fissure strikes nearly east and west and has a dip of about 80 degrees to the south, while the formation fault, which runs substantially parallel to it, has a conformable dip to the south at a lower angle, not exceeding 70 degrees.

The quartz in this vein, where encountered, was practically barren, with the exception of copper carbonate stain; this gradually increased as the drift was extended to the east and commenced to yield some spots of

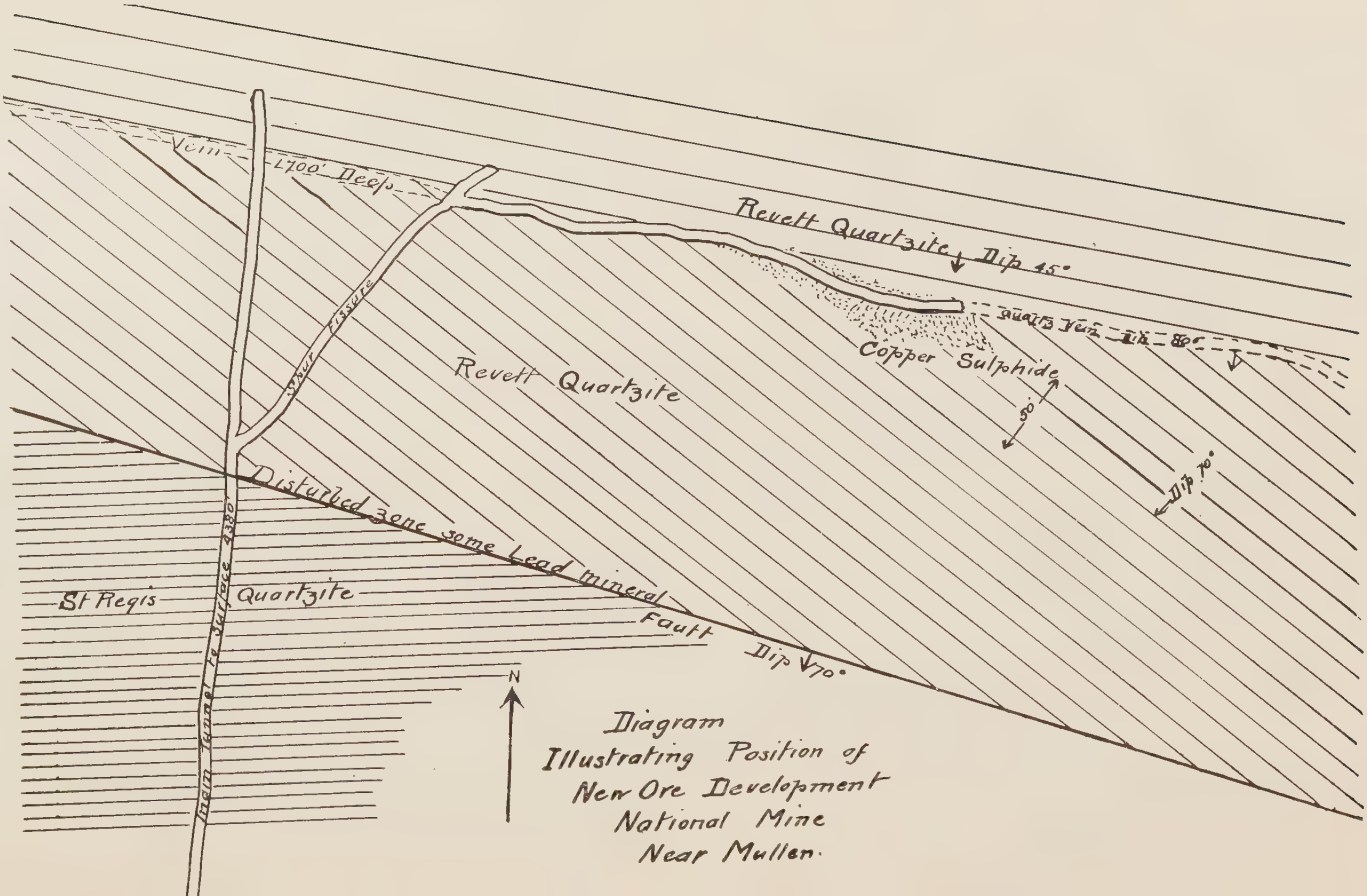

Diagram
Illustrating Position of
New Ore Development
National Mine
Near Mullen.

rich red oxide and solid green carbonate mineral sprinkled with native silver crystals.

When the writer visited this property in December the drift had been extended about 300 feet, and about 80 feet back from the face the coarse Revett quartzite beds on both sides of the quartz vein were richly mineralized with finely disseminated copper sulphide minerals, including chalcopyrite, bornite and chalcocite ores, and very much resembled some of the best sulphide stopes of the Snowstorm mine.

The quartzite beds with their steep dip to the southwest, seem to strike southeast on the south side of the drift, while on the north side the structure seems to be more parallel to the fissure and dip at a much less angle, and while still mineralized are not so richly impregnated as the south beds are.

The oxidized specimen ore found in the quartz vein would give fancy figures for assays in picked samples in both copper and silver. A series of samples taken from the sulphide impregnated quartzite ores show the characteristic values in copper and silver for which the Snowstorm ore of a similar character have been noted, with the advantage of a uniform result of gold in all the samples, ranging from 40 cents to several dollars per ton. This strike is localized at a point west of a south line drawn straight down through the property from the old shaft workings.

It is my opinion that this remarkably true quartz filled fissure on which the development is progressing is the original vent or source of the ore minerals through which ascending solutions permeated the more favorable quartzite wall rocks, and if this shoot of mineral shows a comparatively strong rake to the east in the dip of the vein, as was experienced at the Snowstorm Mine, it should extend in length to the east, past the north and south line, through the old shaft workings several hundred feet.

There is hardly any likelihood of the formation fault

causing any interruption to this ore body by reason of the fact that it is dipping the same way as the vein at a lower angle, and it would have to perform some unlikely stunts of divergence from its present strike and dip to cause any trouble to the normal appearing ore conditions that now seem to prevail in connection with the main trunk fissure described, and the property gives eminent evidence at this time of containing an ore shoot that will equal and probably far exceed the value of the Snowstorm shoot as a source of copper-silver ore and mining profits.

Against this theory of the extent of this ore body and its origin, it is the opinion of Mr. George Huston, a local geologist of Mullan, and other authorities, that the sulphide ore occurrence that has been encountered on this property, and also on the Snowstorm Mine, is a bedded impregnation collected by a lateral secretion and downward circulation of ore solutions from the general Revett quartzite beds of this belt, which are said to be slightly impregnated with copper minerals through their entire mass, that have been concentrated by cold water circulation into localized quartzite beds of favorable texture, the ends of these beds being clipped off by the formation fault and that its accompanying gouge has formed a dam or reservoir which will terminate the ore body on its strike in that direction, which is believed by these authorities to be the course of the quartzite beds between the quartz fissure and the fault.

If the theory proves correct, it means there has already been crosscut by the angling drift along the quartz fissure a thickness of fully 50 feet of the rich ore bearing quartzite beds, which will extend several hundred feet before being interrupted by the fault and will still present a magnificent reserve of mineral, whose upward and downward extent is problematical, but must be very considerable.

The further progress of the development of this new ore channel will soon determine which of these theories has the most virtue, and in either event this strike presages the

development of a big mine, for while a very limited section of the deposit is yet exposed, the mineralization is so uniform and so characteristic of that experienced in the Snowstorm as to leave hardly any doubt in the minds of people familiar with these conditions that it will have very considerable magnitude in both length and depth and fully warrants the anticipation of a big new copper-silver ore producer for this section of the Coeur d'Alenes, and presents a gratifying reward for the several years of expensive development work it has cost and the great faith of its sponsors in the fertility of the pronounced Coeur d'Alene fissures on very slim surface showings of mineral.

Information received after the middle of January from this property and before this matter had passed through the printer's hands, reports an extension of a cross-cut from the main fissure to the south 85 feet in length which shows 65 feet of ore that gives on a systematic sampling an average value of 2½ per cent copper, 5 ounces silver, and 80 cents gold per ton, indicating a very large body of mineral in which the precious values are particularly interesting.

This strike has greatly stimulated interest in other struggling development enterprises on this and other veins lying to the east and west of it and has greatly enhanced their speculative value as probable sources of new ore development.

NINE MILE DISTRICT.

The mines of the Nine Mile District, immediately north of Wallace, have shown a more marked advance in production and new ore development and milling equipment during the past year than during any year since the discovery of the district, and the coming season will see this section jump into prominence as a source of rich mineral traffic, almost equal to any other division of the Coeur d'Alenes, unless the mining industry is interrupted by a serious cut in the market value of the metals most of its mines produce, in which zinc values figure prominently.

The successful development and blocking out of big ore reserves in these properties is gratifying from the fact, as shown by the Government Geological map, that, with the exception of the Tamarack-Custer Consolidation, itself on thin ice in that respect, they are all situated in the discredited Pritchard formations, or in a very narrow and shallow cap of Burke formation that overlies them. This should have the effect of greatly broadening the probable area for productive and profitable ore deposits in the Coeur d'Alene District by stimulating extensive development in the more promising fissures of this formation, whose now proven ore carrying capacity should also have an important bearing on the further downward extension of some of the famous old ore bodies, whose failure have been, in several instances, credited to the penetration of this Pritchard formation below the more favorable Burke quartzite.

Success Mine—The prevailing good demand and market prices for zinc have proven a great factor in the profit end of the Success Mine operation on Nine Mile, whose output of zinc has far exceeded that of any other mine in the State during the past year, or any other year in its own history, and has yielded a number of handsome dividends to its fortunate owners. The management of this property has continued an energetic campaign of development in addition to a very large output of ore through the year, both by sinking 200 feet from the mill tunnel, where the main ore shoots have been drifted upon and found to be maintaining their characteristic high values in zinc and lead-silver, and by extending the stopes up through the old works, that were abandoned years ago, where large reserves of zinc mineral have been opened up, the property is now in an excellent stage of development with a year's ore broken ahead in the stopes, ranging through to the grass roots of the deposit, and can supply the milling requirements of over 200 tons a day for a year in ad-

vance, if necessary, without doing another tap of development work.

The bottom of the mine, however, as far as opened, shows as much strength as any horizon in its development and indicates a long life of production, and is a gratifying reward for the adventuresome spirit displayed by its sponsor and principal owner, Mr. H. F. Samuels.

A short distance above the Success, on the same side of Nine Mile Creek, The Tamarack-Custer Consolidated Mining Company rounded out its business affairs during the year after a long seige of negotiation and commenced an energetic campaign of further development and equipment.

This enterprise has obtained a long lease on the milling plant owned by the Rex Mining Company, situated just below the Success Mill on Nine Mile above Bradyville, which has been connected with the mine by a long overhead wire rope tramway and has a capacity for treating 400 tons of ore per day. This milling equipment was nearing completion at the time of my visit in December and expected to start operations shortly after the first of the year, with an initial tonnage of 200 tons per day, which is expected to be gradually increased to the maximum output of 400 tons per day during the year.

The ore deposits of these combined properties are of a most desirable character and extent and present development conditions of the mine insure a further important expansion of ore reserves by additional work at the Custer lower tunnel level.

The main ore shoot in the Tamarack is 335 feet long and 10 feet wide, developed through an adit tunnel at a depth of 450 feet below the surface. It presents a magnificent channel of high-grade concentrating lead-silver ore in which fat streaks of clean shipping mineral are found.

This same ore shoot has been cut by the extension of the old workings of the Custer No. 4 tunnel, where it is

shown to be 12 feet wide and nearly half of its width in first-class ore carrying about 60 per cent lead and three-fourths of an ounce silver to each per cent lead.

The No. 4 Custer tunnel is 3,000 feet long and includes a lot of poorly directed cross-cutting and drifting work by the old operators in their efforts to find this ore body, which was missed, together with the downward extension of the old Custer ore channels, lying several hundred feet further east, but whose successful development at this deep level, with the present knowledge of the faulting system and the ore bearing virtue of this formation that has been demonstrated by the operation of other properties near by, there is little doubt but that the old Custer ore channels, worked in the early days of the district, which are credited with a total output that yielded over half a million dollars in profits from the upper workings, will again be recovered and greatly enhance the value and tonnage capacity of the combined properties.

Interstate Callahan Mine—On the opposite side of Nine Mile, embracing a very large group of patented claims that include the direct western extension strike of the famous Hercules fissure, the Consolidated Interstate Callahan Mining Company, a well financed institution, has prosecuted an extensive and thorough campaign of development throughout the year, including the completion of a cross-cut tunnel 3,800 feet long that cuts the main vein of the property 1,200 feet deep and at a point 400 feet under the lower tunnel of the adjacent Callahan ore development with which it has recently been connected. This work disclosed a splendid ore channel that has been drifted upon for 350 feet in length, with ore still going ahead in the face in a big strong body.

This ore body is from two to 19 feet thick and carries some splendid showings of high grade shipping lead ore containing from 20 to 30 ounces of silver per ton in lenzes up to three feet thick. The average of the whole body is

estimated at 7 per cent lead and 10 to 15 per cent zinc, the latter fairly free from iron and occurs in clean lenzes that will afford some crude shipping zinc mineral from 50 to 60 per cent grade. The contiguous Callahan ore shoot has a proven length of 147 feet, with its full extent yet undetermined, but definite evidence in the lower drift that it will be 250 feet long and carry an average value of about 15 per cent lead and better than one-half ounce silver to the unit of lead.

The Callahan ore body has been opened through independent surface workings at a depth of 490 feet, and at one point shows nine and one-half feet of clean, loose texture, fairly coarse grained galena carrying over 70 per cent lead and 46 ounces silver, and presenting as desirable a character of lead sulphide mineral as has ever been found in the whole Couer d'Alene District, which, together with its relatively high silver values, is a gratifying tribute to ore bearing possibilities of the discredited formations of this section and proves they can produce as clean lead and as good silver as the more favorably considered wall rocks where the fissuring conditions are right.

There has been shipped from the present development of the Callahan property 42 cars of hand picked mineral that has averaged 70 per cent lead and 40 ounces silver, which is fully as high a silver ratio to lead if not higher than the average of the whole Couer d'Alene District. In this connection, and in support of technical exhaustion theories, it is pointed out that some of the older and hard worked ore bodies of the Couer d'Alenes are showing a gradual loss of silver values as depth is obtained, but an interesting contrast to this condition is the fact that two of the deepest developed ore deposits in Shoshone County, now worked at a depth of fully 3,400 feet, still carry the maximum silver ratio of their best sulphide horizons.

Local authorities consider the wall rocks of Interstate ore body to be the lower Burke, but the Government map puts it well within the Pritchard areas. It is intersected

by a dike of monzonite porphyry six to eight feet thick which bears an interesting similarity and probable relationship to the ore occurence as that experienced in the Bonanza ore channel of the Hercules Mine farther east.

The combined ore development of the Interstate-Callahan properties are of such extent as to warrant the company in the erection of a mill of 500 tons daily capacity on Nine Mile Creek just below the month of the main cross-cut tunnel. This mill is now nearing completion and is expected to be in successful operation by early spring, while the area embraced within the company's territory and the strike of other known ore courses through it is such as to permit of a very extensive campaign of additional development and the definite prospect of finding other large ore resources.

The mine plant consists of a number of new buildings, sawmill, large electric driven air compressor, and the main tunnel is soon to be equipped with electric haulage.

The mill is a half mile below the mine and will be connected with an overhead tramway with a capacity of forty tons an hour, and should existing metal prices continue to prevail, there is not any question that the Consolidated Interstate Callahan property will enter the list of dividend payers at a very early date, and from the magnitude of the enterprise, and the fact that it is blessed with a capable, up-to-date management, fully awake to the desirability of additional territorial expansion, the Enterprise has a definite prospect of becoming one of the chief sources of mining profits in the Couer d'Alene District.

Idora Hill Mine—Another interesting ore deposit in this formation is that of the Idora Hill Mining Company, over the summit from Nine Mile on Beaver Creek slope.

This enterprise, under an energetic new management, has recently developed a defined ore shoot to a maximum depth of 600 feet through adit tunnels and cross-cut work, disclosing some bodies of fine concentrating mineral four to

six feet thick, with occasional rich streaks of high grade shipping ore. The full length of the main ore shoot has not been determined but gives evidence of continuing for several hundred feet, as indicated by drifts and cross-cuts along its course.

It is said to average about 16 per cent lead in the more definite reserves, with nearly a half ounce of silver to the unit of lead and 7 per cent zinc loosely crystaline and free milling, and should permit a clean separation.

The company is now building a concentrating mill of 50 tons daily capacity to be connected with 2,000 feet of aerial tramway.

A recent carload shipments of hand jigged ore from this deposit gave returns of 55½ per cent lead and 29 ounces of silver per ton, and the company's engineers figured a resource of 18,000 tons of ore undercut at a conservatiive estimate, above the middle level of the property, with some splendid evidences in the lower level of an early development of a very much larger reserve by extending the No. 3 drift further east.

Tuscumbia Mine—The adjoining Tuscumbia Mine is another promising deposit that has been proven to maintain its ore values at depth, by the extension of the Idora No. 3 tunnel, which has intersected the Tuscumbia vein at a depth of 450 feet, where it shows a width of 14 feet of concentrating ore This strike has been drifted upon to determine its lineal extent, but the experience of other recent development in this formation gives the most flattering indications of the existence of a large and important ore channel on this property when more fully explored.

Sunset Mine—At Sunset Peak, between the head of Nine Mile and Beaver Creek, the Sunset Mine, owned by Senator Clark of Montana, carries one of the notable fissures of this section, but has remained idle for a number of years until the recent active demand and broad market for

zinc mineral, which is doubtless responsible for the active interest displayed in this old property by its owners.

The Sunset was equipped with a small hoist and is now being developed through a vertical shaft sunk in the footwall formation near the outcrop of the vein at the north portal of the tunnel, which penetrates Sunset Peak.

The property carries a large fissure vein that is in places 10 to 15 feet wide and richly mineralized with zinc-lead ore.

A level will be run out at the 200 foot station from the new shaft and the vein explored by drifting to determine its ore bearing merits, and if this preliminary work proves satisfactory the deposit will doubtless become the scene of a more extended plan of development and milling equipment.

Amazon Manhattan Mine—A little further west the Amazon Manhattan Mine was worked during the year under a lease and developed an ore shoot 145 feet long and eight feet wide that is estimated to carry an average value of about 20 per cent zinc and 16 per cent lead, and the higher grade lead ore carrying 30 to 40 ounces in silver.

This operation shipped eight cars of hand picked zinc ore during the year containing 44 per cent zinc.

The property is developed with three tunnels and indicates a valuable source of high grade ore rich in zinc.

Near this property the Nipsic Mining Company have started development on their interesting deposit of characteristic ore of this locality, from which shipments were made a number of years ago.

This property has a good showing of mineral and prospects of success, and its revival has been stimulated by the valuable ore development of the adjacent groups.

North Side Mines—The North Side Mines, tributary to Murray, continue to be hampered by lack of the advantage of electrical power enjoyed by other portions of the district.

Their power requirements have been supplied in two

important instances with gasoline engines, which, however, are rather expensive to operate.

The Monarch Mine was successfully operated by leases during the year and shipped 20 cars of high grade lead concentrates and five cars of zinc ore, averaging 45 per cent zinc.

The Black Horse Mine was under development and made a short run with its new mill and some small shipments of ore.

The Terrible Edith continues to produce, and shipped twelve cars of high grade mineral, and maintains its promise of making a good mine if given the necessary capital support for the more extended development of its ore resources.

The Chicago London property at Paragon, successfully developed its lost ore body at a new and deeper level and is in shape to make a further ore production of lead and zinc with a nice reserve of ore in sight.

At the Jack Waite Mine the main lower cross-cut tunnel has been extended to the vein, which is now being drifted upon to cut the ore bodies disclosed in the main adit level above.

This property shipped fifteen cars of high grade lead-silver ore during the year.

The new level is being driven at a depth of 500 feet in the vein below the upper ore showing and a big improvement in values and lineal extent is anticipated at this horizon.

Pine Creek District—In the Pine Creek District, south of Kellogg, considerable activity was displayed among the numerous flattering prospects and ore resources of that section during the year. The most interesting transaction was the consolidation of the Surprise and the Highland Chief Mines.

These two mines were developed on the same vein, the Surprise having a splendid new milling plant but a limited area of territory on the strike of the vein, while the

Highland Chief carries an extensive stretch of ore-bearing ground on its territory.

The combined properties will now be operated from the Surprise tunnel, which taps the vein on the lowest part of its development from behind the mill bin and will insure a stretch of stoping ground seven or eight hundred feet long.

This consolidated property has now quite a substantial ore reserve and a good mill with which to treat it, of 100 tons daily capacity, that is equipped with first-class machinery, whose capacity can be cheaply increased, and its operation during the past pear produced 776,000 pounds of zinc concentrates and 459,000 pounds of lead concentrates.

This ore course carries an excess of zinc over lead values, but the minerals are readily separated into clean commercial products as the ore is not mixed with other objectionable minerals, and if this district is given railroad transportation, as is promised in the near future, this property should become a profitable mining and milling enterprise of considerable capacity.

The bulk of the Pine Creek District is embraced within the Pritchard formations, which, however, have been intensely faulted, and show some contrasting inclusions of limited belts and areas of pure quartzite. One of these quartzite belts is closely associated with the well-known Nabob Mine, whose well-defined, closely parallel fissure veins were opened through a long cross-cut tunnel at a depth of several hundred feet below the upper workings.

This tunnel encountered 14 feet of concentrating ore in the Nabob vein and a raise has been put up connecting with the shaft workings sunk from the surface.

The parallel vein on the property known as the Chrysolite, which shows a splendid development and a long shoot of good concentrating ore in the shallow upper tunnel, was also encountered in this work but has not been fully ex-

plored by drifting as yet. However. the evidence of the permanency of these deposits at depth is manifested by ore body encountered on the Nabob fissure and there is hardly any question but that a fine showing of mineral will be opened up on the Chrysolite vein when it is fully explored at this lower level, that should result in giving the property quit a reserve of good milling ore.

This ore, like the other deposits on Pine Creek, shows a rich zinc mixture with the lead sulphides, but the minerals have a distinct, fairly coarse crystalline texture and will doubtless be easily separated in milling, and the general results of this long cross-cut tunnel work, as far as the development has progressed since the veins were encountered, has fully warranted its cost and gives excellent promise at this time of resulting in the development of a profitable mine.

The formation adjacent to the Nabob group are richly mineraiized and show several other important manifestations of high grade lead-zine ore, and some handsome showings of mineral were opened up during the year on the adjacent Idaho group, the Sidney group, and other properties, each of which are giving evidence of developing commercial ore channels that in combination with the Nabob property could afford the basis of a good consolidation of interest and warrant a more extensive plan of permanent development and milling equipment.

Negotiations were in progress late in the year for the outlay of considerable capital in the equipment of the Douglas, Mine, on upper Pine Creek, and if the experiments now in progress for the treatment of its rather complicated ore mixtures prove reasonably successful, a good size milling plant will doubtless be installed during the coming season, as this property has one of the longest and best developed ore shoots on Pine Creek. It carries an ore comprising a complex blending of zinc, lead, and iron sulphideas of very fine grain and in places almost amorphous texture.

The experiments now being carried on for its separation are in the hands of some of the ablest metallurgists in the country, and it is not unlikely that one of the modern flotation processes may be found successful in the separation of its relatively rich zinc and lead values, and another producing mine result, as the ore resources on the property are quite extensive and already well developed.

Lower down on Pine Crek, the Amy and Matchless group, after being quite well equipped with an expensive surface plant by the Culver Mining Company, and afflicted with a period of poor management, ceased operations and was idle for a large portion of the year.

A readjustment of the affairs of the property, however, was in progress near the close of the season, with the former owner in charge, gave promise of an early resumption of operations.

This property has a handsome showing of rich concentrating lead-zinc ore in a well marked fissure that has been drifted upon for several hundred feet and warrants further development by sinking on the main ore body on the west side of the creek, as it gives definite evidence of containing a considerable resource of profitable mineral if more fully developed.

A short distance farther north, the Northern Light Mine has been developed through a shaft 160 feet deep and a cross-cut was run to the south, which encountered the vein sought for, two feet wide. This has been drifted upon to the east a distance of 130 feet for the purpose of determining whether the ore showing found in the upper level raked eastward, and into the adjoining claim that was being negotiated for by the company, but this proved not to be the case. The drift was then continued westward on the vein from the cross-cut for 30 feet showing some excellent values in lead concentrating ore free from zinc and gave evidence that the ore bodies sought for would be developed by a further extension of the drift in this direction.

At this stage of the work, however, the finances of the company were exhausted and the operation temporarily suspended.

This property carries an excellent showing of mineral in a cross-cut at an 80 foot level in the shaft including a very pronounced fissure vein with a good gouge.

Its surface manifestations are also very favorable, consisting of several lead bearing quartz fissures and connecting stringers in a belt of pure quartzite. This operation has not been as fully financed as the showings warrant, and if funds can be raised to further explore the ore bearing zone disclosed at the 80 foot level in the new 160 foot level by further drifting and cross-cutting, it will likely result in the development of a profitable ore body, and is, to say the least, an attractive speculative chance to that end, well worth the cost to its further determination.

DRY ORE BELT.

Lying between Wardner and Wallace, on the steep mountain slopes of Big Creek and adjacent tributaries that enter the South Fork from the south side, there is a system of well defined faults and fissure veins of excellent promise of future possibilities for deep mining.

In this section the Yankee Boy Mine has been developed to considerable extent and carries a large vein with a narrow paystreak of high grade mineral rich in silver, showing an association of galena and grey copper, that has made intermittent carload shipments from this development over a period of a year.

This property has recently been put in the hands of some well known practical miners of the district in two leasing units, both of which have already made carload shipments of mineral, averaging 200 ounces of silver per ton.

There are quite extensive backs of stoping ground already developed on this property, and the operation of

these leases is likely to prove successful, both to the owners and the lessors.

On this same belt, on a parallel line of fissuring a little further north, near the valley, a large amount of development has been done and in some instances shipments made at different times from several mines along this interesting line of pronounced fissuring, including the Chester, United Lead, Nellie, Argentine, Mineral Point, Silver Rock and the Coeur d'Alene Development Company claims, each of these properties embracing good sized groups, and have flattering prospects of ultimately encountering profitable ore bodies if developed to sufficient depth.

The trouble, however, with this belt is the fact that its fissures are mostly contained in the Wallace slate formations associated with a limited belt of St. Regis quartzite. These formations are underlaid, however, at no great depth by the most favorably considered Burke quartzite, which is well exposed in the long cross-cut tunnel of the United Lead Mines. This opening has been driven back into the mountain from a convenient elevation above the valley level 3,840 feet to the vein, which has been drifted upon 400 foot, showing a decidedly well marked fissure in the shaly Wallace formation that is from one to three feet wide, carrying quartz, siderite, galena and grey copper.

In places this mineral combination shows from 6 to 18 inches of nearly clean ore of good grade in lead and silver. This drift is directly under some shallow tunnel development on the same vein, on the dip, but a thousand feet deeper in the ground, showing a remarkable persistency of the fissure in this shaly formation to great depth and indicating its continuity downward into the underlying more brittle quartzite formations, where an expansion of the ore values are likely to be encountered.

This long tunnel has been largely driven since the geological survey of the district by the Government and has

demonstrated their conclusions as to the relative rock structure of the mountain to have been very closely figured out.

The United Lead Company's group is very extensive in area and carries another parallel fissure vein a few hundred feet south that should be opened by extending the cross-cut in the hope of finding it in a more favorable ore bearing condition. This tunnel makes a splendid entry for the extended exploration of this and other adjacent properties, and if a plan could be substantially financed to attack this strong system of fissures through this avenue, or through one of the other long tunnels of this belt, and explore it at further depth into the more favorable ore bearing rocks that are shown by the Government geological map to underlie it, it would likely result in establishing another extensive and profitable lead-silver bearing zone for the Coeur d'Alene District.

On the opposite side of South Fork Valley there is a wide zone of Pritchard formations, which is backed at a short distance from the river by an interesting belt of Burke, Revett, and St. Regis rocks, along the margin of which, and in the Pritchard rocks extending from Nine Mile Creek to Moon Creek, and beyond, there is a succession of interesting fissure veins and mining prospects that at several points disclose good ore values, including some very high grade silver minerals.

The only prospects I visited in this locality were the small rich fissures on Two Mile Creek, which were patented by the late Senator Heyburn a number of years ago, and contain some very high grade ore by selection of the silver chloride and grey copper variety.

Adjoining this property to the northwest, the New Hope Mining Company has done a lot of preliminary development work, including two tunnels of considerable length.

The lower tunnel is a cross-cut about 1,000 feet long which has already penetrated one of the two strong veins

that traverse the property and has found a well marked quartz filled fissure with some fair values in lead and silver, but not in commercial quantities so far. The face of the main cross-cut still lacks 100 feet, or such a matter, of penetrating the second vein.

This tunnel is situated several hundred feet east of an upper tunnel, which was caved at the time of my visit, but the dump and the outcrop of the ore course shows some splendid manifestations of soft brown mineral gossan, associated with quartz gangue that looks like the spongy residue of a massive sulphide mineral, and some drifting on the vein from the main cross-cut in this direction is warranted and gives promise of developing a commercial ore shoot.

This group carries some other surface manifestations of underlying mineral bodies in the form of wide zones of richly iron stained silicious breccia that are well worthy of development and investigation at depth, as they also present surface manifestations that in other points of the district have resulted in the development of good ore bodies.

Wardner Leases—In the old grass root levels of the Bunker Hill and Sullivan properties several incompletely prospected blocks of ground in the neighborhood of former ore bodies which have become too remote for convenient handling in the deeper operation of this big mine have been turned over to leasing parties composed of local miners. Of these the Small Hopes lease and the Tyler lease have been successfully handled, especially the latter, which has made a handsome production of high grade shipping mineral throughout the year that has paid handsome profits to both the company and the lessors. The old Sierra Nevada ground in Deadwood Gulch, now under lease to Mr. D. W. Peoples, whose years of experience as superintendent and chief ore scout of the famous Last Chance ore channels nearby especially fits him for scent-

ing out any overlooked values in this long abandoned old ore course, and I think he has the hearty well wishes of the Wardner-Kellogg community for his success. This vein has the reputation of producing the richest silver ore in the district and made quite a large output of high grade mineral during its early history.

The vein has been a puzzle to all the earlier geologists who studied this field by reason of its sharply diverging strike and contrasting mineral contents to the ore deposits along the main Wardner lode. It is now definitely known to be one of the old series of fissures that strike northeast and dip southeast, exactly opposite to the Wardner lode angles. This old system of fissures, which was cut and faulted by the Wardner lode, has developed several extensive and valuable ore bodies in recent years, and the knowledge and appreciation of its importance may prove a big advantage in the further exploration of the Sierra Nevada.

Alhambra Mine—A short distance west of Wardner the Alhambra Mine, embracing an extensive group of patented claims covering the eastern extension of the Wardner lode beyond the Sullivan workings, is being developed through a long cross-cut tunnel and several thousand feet of drifting. This work has been systematically maintained with a small force of men for years. The property has a great surface showing of iron ore and is embraced within the most favorable ore bearing rocks of the district, but so far the management has been unable to discover the commercial ore channels that were expected, but one nice showing of clean galena ore has been found that is now being further developed by drifting, and the intimate geological study of this vicinity in connection with the adjacent apex litigation troubles of recent years may add some additional value to this ground and facilitate its further exploration to a successful issue.

TWIN FALLS COUNTY.

Twin Falls County is noted as one of the richest and best developed agricultural counties using irrigation in the State, and has given the State wide advertising by virtue of the large and successful irrigation projects which have been developed within its boundaries.

Its mineral resources so far are limited to a variety of excellent building materials, including limestone and shale, which may ultimately form the basis of a Portland cement manufactory.

It also has extensive areas of unproven lignite coal, and I think embraces some of the middle carboniferous formations which have proven so rich in phosphate deposits in our eastern counties.

WASHINGTON COUNTY.

The principal mineral features of Washington County were cut off by the creation of Adams County, and there has been very little progress made in its remaining mineral resources, which embrace, however, some interesting copper-iron ore deposits in the Iron Mountain Districts.

Washington County also has some promising gold prospects on Monroe Creek, and some very extensive deposits of Fuller's earth on the same creek slopes, a few miles above Weiser.

This mineral is extensively used as a filtering material in sugar and oil refining processes, where a colorless filtering material is desirable, and these deposits are likely at some time in the future to become a source of an interesting quarrying and shipping business, if sufficiently favorable rates can be obtained to the points of use.

METAL PRODUCTION FOR 1912.

ADA COUNTY.

Gold, fine oz., 370	$	7,647 00
Silver, fine oz., 570		346 00
Total value	$	7,993 00

ADAMS COUNTY.

Gold, fine oz., 85	$	1,757 00
Silver, fine oz., 1,190		723 00
Copper, lbs., 73,000		12,088 00
Total value	$	14,568 00

BINGHAM AND BONNEVILLE.

Gold, fine oz., 81	$	1,674 27
Silver, fine oz., 3		1 83
Total value	$	1,676 10

BLAINE COUNTY.

Gold, fine oz., 750	$	15,502 00
Silver, fine oz., 21,721		13,212 00
Zinc, lbs., 300,000		20,820 00
Lead, lbs., 1,670,000		74,649 00
Total	$	124,183 00

BOISE COUNTY.

Gold, fine oz., 25,071	$	518,218 00
Silver, fine oz., 6,940		4,222 00
Total value	$	522,440 00

BONNER COUNTY.

Gold, fine oz., 329	$	6,800 00
Silver, fine oz., 7,000		4,258 00
Lead, lbs., 68,000		3,040 00
Total value	$	14,098 00

CANYON COUNTY.

Gold, fine oz., 12	$	248 00
Silver, fine oz., 3		183 00
Total value	$	431 00

CLEARWATER COUNTY.

Gold, fine oz., 2,692	$	55,644 00
Silver, fine oz., 1,208		735 00
Total value	$	56,379 00

CUSTER COUNTY.

Gold, fine oz., 3,224	$	66,640 00
Silver, fine oz., 162,783		99,016 00
Copper, lbs., 3,120,000		515,672 00
Lead, lbs., 943,000		42,152 00
Total value	$	723,480 00

ELMORE COUNTY.

Gold, fine oz., 3,500	$	77,345 00
Silver, fine oz., 2,700		1,642 41
Total value	$	78,987 41

IDAHO COUNTY.

Gold, fine oz., 2,700	$ 55,809 00
Silver, fine oz., 1,162	697 00
Total value	$ 56,496 00

LEMHI COUNTY.

Gold, fine oz., 11,402	$ 235,680 00
Silver, fine oz., 467,042	284,701 00
Lead, lbs., 20,026,000	895,162 00
Total value	$ 1,415,543 00

LINCOLN COUNTY.

Gold, fine oz., 3,40	$ 70 28
Silver, fine oz., 1	60
Total value	$ 70 88

NEZ PERCE COUNTY.

Gold, fine oz., 157	$ 3,245 00
Silver, fine oz., 15	9 13
Total value	$ 3,254 13

ONEIDA COUNTY.

Gold, fine oz., 15	$ 309 95
Silver, fine oz., 2	1 22
Total value	$ 311 17

OWYHEE COUNTY.

Gold, fine oz., 14,270	$ 294,961 00
Silver, fine oz., 202,042	122,902 00
Total value	$ 417,863 00

SHOSHONE COUNTY.

Gold, fine oz., 4,446,6	$ 91,911 00
Silver, fine oz., 7,364,581	4,479,877 00
Lead, lbs., 273,347,813	12,118,648 00
Zinc, lbs., 15,943,840	1,106,502 00
Copper, lbs., 4,199,280	695,400 00
Total value	$18,492,338 00

TWIN FALLS COUNTY.

Gold, fine oz., 127	$ 2,625 00
Silver, fine oz., 3½	2 13
Total value	$ 2,627 13

WASHINGTON COUNTY.

Gold, fine oz., 66	$ 1,364 00
Silver, fine oz., 4¼	2 59
Total value	$ 1,366 59

TOTALS FOR THE STATE.

Gold, fine oz., 69,300.10	$ 1,432,434 00
Silver, fine oz., 8,238,971	5,011,766 00
Lead, lbs., 296,054,813	13,233,650 00
Copper, lbs., 7,392,280	1,224,161 00
Zinc, lbs., 16,243,840	1,127,316 00
Grand total for 1912	$22,029,327 00
Grand total for 1911	19,270,212 00
Increase	$ 2,759,115 00

ANNUAL METAL OUTPUT OF IDAHO SINCE 1898

TOTAL FOR THE STATE FOR THE YEAR 1898.

Gold, fine oz., 91,698	$ 1,895,566 00
Silver fine oz., 5,256,700	3,654 020 00
Lead, lbs, 122,479,275	4,899,171 00
Total	$10,448,757 00

TOTAL FOR THE STATE FOR THE YEAR 1899.

Gold, fine oz., 75,054	$ 1,550,958 00
Silver, fine oz., 4,480,174	688,105 00
Lead, lbs., 86,449,506	3,760,553 00
Copper	60,000 00
Total	$ 6,059,616 00

TOTAL FOR THE STATE FOR THE YEAR 1900.

By direct shipment:	
Gold, fine oz., 102,782	$ 2,124,603 94
Silver, fine oz., 4,324,133	2,534,480 00
Lead, lbs., 96,425,500	3,857,020 00
Copper	35,000 00
	$ 8,551,103 94
Through the U. S. assay office	1,699,760 22
Estimated from other sources	1,000,000 00
Total	$11,250,864 16

TOTAL FOR THE STATE FOR THE YEAR 1901.

Gold, fine oz., 110,228	$ 2,280,422 76
Silver, fine oz., 3,305,154	1,983,092 00
Lead, lbs., 65,967,000	2,638,680 00
Total	$ 6,902,194 76

TOTAL FOR THE STATE FOR THE YEAR 1902.

Gold, fine oz., 119,363	$ 2,467,233 21
Silver, fine oz., 5,259,778	3,655,866 80
Lead, lbs., 119,223,000	4,172,805 00
Total	$10,295,905 00

TOTAL FOR THE STATE FOR THE YEAR 1903.

Gold, fine oz., 92,938,42	$ 2,085,993 76
Silver, fine oz., 7,224,021.58	4,334,412 60
Lead, lbs., 220,857,956	9,386,213 13
Copper, lbs., 2,524,000	336,954 00
Total	$16,143,573 49

TOTAL FOR THE STATE FOR THE YEAR 1904.

Gold, fine oz., 84,461.89	$ 1,845,828 08
Silver, fine oz., 8,284,639.12	4,970,783 40
Lead, lbs., 226,261,728	9,729,425 86
Copper, lbs., 5,422,007.05	704,860 91
Total	$17,250,898 25

TOTAL FOR THE STATE FOR THE YEAR 1905.

Gold, fine oz., 60,515.91	$ 1,250,863 85
Silver, fine oz., 8,626,794.55	5,196,270 51
Lead, lbs., 260,791,456.00	12,257,198 43
Copper, lbs., 6,661,400.00	1,025,189 46
Zinc, lbs., 2,174,960.00	127,887 89
Total	$19,876,409 89

TOTAL FOR THE STATE FOR THE YEAR 1906.

Gold, fine oz., 58,762.32	$ 1,214,617 15
Silver, fine oz., 9,136,860.73	6,071,443 96
Lead, lbs., 255,966,083.00	14,487,680 30
Copper, lbs., 11,640,565.00	2,252,449 32
Zinc, lbs., 1,477,000.00	91,426 30
Antimony, lbs., 90,000	20,700 00
Total	$24,138,317 03

TOTAL FOR THE STATE FOR THE YEAR 1907.

Gold, fine oz., 66,426.29	$ 1,373,031 40
Silver, fine oz., 8,491,356.13	5,546,553 82
Lead, lbs., 234,404,920	12,470,341 74
Copper, lbs., 10,847,905	2,241,177 17
Zinc, lbs., 9,192,551	534,087 21
Total	$22,165,191 34

TOTAL FOR THE STATE FOR THE YEAR 1908.

Gold, fine oz., 68,145.16	$ 1,409,992 97
Silver, fine oz., 7,660,507.38	4,047,811 63
Lead, lbs., 207,998,499	8,764,485 35
Copper, lbs., 10,110,506	1,336,608 89
Zinc, lbs., 64,000	3,020 80
Total	$15,561,131 64

TOTAL FOR THE STATE FOR THE YEAR 1909.

Gold, fine oz., 70,898,938	$ 1,465,481 05
Silver, fine oz., 7,039,451.20	3,625,317 40
Lead, lbs., 217,594,679	9,356,571 20
Copper, lbs., 7,759,886.0	1,034,651 50
Zinc, lbs., 1,906,200.0	104,841 00
Coal, tons, 3,500	20,000 00
Total	20,000 00
Total	$15,606,862 00

TOTAL FOR THE STATE FOR THE YEAR 1910.

Gold, fine oz., 49,289.22	$ 1,018,808 20
Silver, fine oz., 7,890,388	4,268,813 00
Lead, lbs., 239,144,570.00	10,761,057 70
Copper, lbs., 5,837,639.00	753,055 40
Zinc, lbs., 5,995,600.00	333,513 60
Total	$17,135,695 90

TOTAL FOR THE STATE FOR THE YEAR 1911.

Gold, fine oz., 66,927.11	$ 1,375,068 22
Silver, fine oz., 8,592,400.63	4,579,621 15
Lead, lbs., 274,492,873	12,225,912 56
Copper, lbs., 3,962,060	502,488 67
Zinc, lbs., 10,087,600	386,593 94
Total	$19,270,212 00

TOTAL FOR THE STATE FOR THE YEAR 1912.

Gold, fine oz., 69,300.10	$ 1,432,434 00
Silver, fine oz., 8,238,971	5,011,766 00
Lead, lbs., 296,054,813	13,233,650 00
Copper, lbs., 7,392,280	1,224,161 00
Zinc, lbs., 16,243,840	1,127,316 00
Total	$22,029,327 00

Grand total for the past 15 years.....$234,134,955 46

The above statistics are based on the gross metal contents of the mineral and bullion shipped out of the State and are subject to the discount of the actual loss in smelting which, however, is not nearly so great as the tribute exacted from the producer for this purpose by the smelters who also recover in the aggregate quite an important amount of gold that is not accounted for. Average New York quotations have been used for the baser metals and $20.67 per ounce for gold.